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U.S. Department of Energy, Office of Integration and Disposition

TIE QUARTERLY

Technical Information Exchange: "Sharing Experience, Expertise, and Lessons Learned."

Welcome

John Arthur of the Albuquerque Operations Office, Office of Environmental Operations and Services welcomed everyone to the 13th TIE Workshop. This was the 3rd year that the Department of Energy (DOE) Office of Integration and Disposition (EM-20) has been the sponsor for this workshop. Albuquerque DOE and Sandia National Labs were the hosts of this year's workshop.

Arthur recalled that the TIE workshop was initiated in 1991 in response to the need for better working relationships across the complex. The workshop strives to promote the sharing of lessons learned within the DOE complex, as well as with private industry and academia. Arthur noted that although the focus of the workshop may be on Environmental Management, it is also crosscutting with Defense Programs and the Office of Science.

To emphasize the benefits achieved by better working relationships, Arthur highlighted a landfill lesson learned from Albuquerque that resulted in cost savings due to the exchange of information.

Arthur extended the welcome of the new Assistant Secretary of Environmental Management, Jessie Roberson, and introduced Mary McCune, Ken Chacey, and Congresswoman Heather Wilson.

Mary McCune, DOE Office of Integration and Disposition, Office of Technical Program Integration (EM-22) and the lead for the TIE Workshops, welcomed all those present. She specifically thanked Sandia for hosting the Workshop, and the Field Area Technology Representatives, volunteers from Headquarters and the Field, session chairs, and recorders for their hard work in coordinating this effort.

This TIE Workshop was a special event, a celebration of ten years of the workshop. McCune communicated that TIE has been established as a place to discover new ideas and uncover new lessons learned. Furthermore, the workshop has become a valuable tool for the EM Lessons Learned Program, providing hundreds of lessons each year that are shared through the EM Lessons Learned database.

McCune concluded by requesting that all participants make an effort to provide lessons on cost savings and/or efficiencies realized as a direct result of something learned at TIE, or as a result of a contact that was made at the workshop. These are what make the workshop valuable and provide the basis for continuing the workshop in the future.

Ken Chacey, Director of EM-22, also welcomed all participants attending the TIE Workshop. Chacey touched on the possible changes that are taking place at Headquarters due to the Secretary's top to bottom review. It is expected that this review will be completed in December. The focus of the Department will be on closure, integration, and directing resources to where we get the "biggest bang for the buck". In this regard, TIE plays an important role. Eighty-percent of the workshop participants are people tied directly to the field. Unlike many national meetings where the topics of discussion are broad policy or budget issues, the discussions held at this workshop are about how to solve specific problems at specific sites and share that information.

Chacey provided examples of how TIE has benefited the complex in the past (e.g., improving the ability to transfer information between EM and NNSA, and developing a new approach to the design of a mixed waste landfill cap at Sandia). He noted that there was a great array of very timely and relevant topics to be covered over the next two days. He concluded by stating that this workshop presents a unique opportunity to bring together not only DOE employees and contractors, but also members of Congress; with this, he introduced Heather Wilson.

Congresswoman Heather Wilson provided a video taped address to the workshop participants. She welcomed all participants to the state of New Mexico and requested that there were two things that she would like participants to do at this workshop:

1. Share ideas with each other, and
2. Continue the commitment to the stewardship of the nuclear complex.

Inside the TIE Quarterly

Keynote Luncheon

Michael Zamorski of the Kirkland Area Office introduced the keynote luncheon speaker, Pete Maggiore, Secretary of the New Mexico Environment Department. Mr. Maggiore has over twenty years experience in the field of geology, and has worked in the fields of mineral exploration, oil and gas exploration, academia and environmental consulting. He previously served as Environmental Protection Division Director for the New Mexico Environment Department. In July 1998, the Governor appointed him Cabinet Secretary of the Department.

Maggiore began the address by highlighting the cooperative relationship that exists between DOE and the state regulators in New Mexico. New Mexico has played an important role in the history of nuclear weapons development and, therefore, has some of the most challenging situations facing the DOE complex. The needs of both DOE and the State in addressing these situations have been met due, in part, to their cooperative relationship.

Maggiore went on to acknowledge TIE as a valuable opportunity to share lessons learned. He recommended using this workshop as a springboard for ongoing dialogue, not only within DOE but also with regulators.

The main theme of the address focused on three interrelated issues - the budget, long-term stewardship, and regulation under RCRA:

- Reductions in the budget will have impacts on cleanup goals and timelines at the DOE sites. There appears to be a growing disparity between funding levels and what is required to meet the end state vision. Maggiore emphasized that events like the TIE Workshop, where new opportunities can be shared, can be instrumental in bringing some of the cleanup timelines back to what was initially envisioned.
- Many sites will not cleanup to unrestricted uses. This is one of the reasons why the New Mexico Environment Department is in current discussions with the Governor to allow covenants and institutional controls to be included in the New Mexico State statutes. It is expected that properties can more easily be returned to productive uses with these tools in place. With these tools, however, come long-term stewardship responsibilities. Maggiore emphasized that DOE needs to make a commitment to long-term stewardship. He noted that effective long-term stewardship would require long-term funding and the current budget vagaries are not consistent with these needs. Collectively we need to work to ensure there is long-term funding for long-term stewardship at sites that do not cleanup to unrestricted uses.
- In New Mexico, the Environment Department is trying to be more clear when it comes to regulating the DOE under RCRA. As previously mentioned, the State and DOE have a collaborative working relationship. Maggiore commented, however, that their efforts do not appear to help with securing adequate funding in New Mexico. He has observed that states that have engaged in litigation seem to take precedence with respect to funding.

Maggiore concluded with a summary of examples that illustrate the complexity of the relationships with DOE and interfacing with the public. At Sandia, three years ago the closure date was 2003. Today the closure date is unknown. At Los Alamos National Laboratory the closure date is now 2020. Ground water contamination is proving to be the main challenge there. The RCRA Part B application for the Waste Isolation Pilot Plant was issued in 1999. Since that time the State has been subject to 150 permit modifications.

Maggiore closed by emphasizing the importance of sharing lessons learned and working collaboratively in order to resolve many of these challenging issues.

Measuring Soil Erosion Potential and Plutonium Resuspension to Facilitate Release Standards

Patrick M. Haines, URS/Radian (Rocky Flats Environmental Technology Site)

A problem statement on how to measure soil erosion potential and plutonium resuspension to facilitate release standards was provided. This statement identified the establishment of protective, but attainable surface soil action levels for Pu-contaminated resuspension and transport mechanisms and their resulting contributions to the inhalation pathway. A common occurrence at RF was that technical factors and uncertainties limited attempts to model resuspension and dispersion. Details on the history of the RFETS were given pointing out the fact that the wind at the site was a continuous issue that was dealt with during measurements and analysis. Several methods are being considered. The Residual Radiation (RESRAD) model is being used to assess inhalation doses as part of the risk assessment for the two most-probable post-closure land use scenarios. Specifics for one of the unknowns for measuring fire effects on mass loading was presented and several graphs were provided. Correlating plutonium activity in dust to plutonium activity in soil was another method used for measuring. The results of these activities and analysis were used to create RESRAD inputs from the wind tunnel data, correct for precipitation effects, and to get acceptance by stakeholders.

Field-deployable Radiation Detection Instruments for Characterization or Monitoring of Contaminants

David Roelant, Florida International University

This presentation started by noting that there are over 600 environmental technology databases in 1997, but that there are only about a dozen that are useful. Several of these were identified and the point was made that the FIU-HCET database launched in 2002 already has over 1,000 technologies, with over 150 international technologies, and R&D bench prototypes to field validated instruments and allow searches by multiple categories. A list of the number of sensors in various databases was given on a chart. In addition, lists of metal and organic sensors available or under development were provided. The sensor technologies tested, as well as the technology needs and specifications, were outlined. Conclusions in the presentation were that databases will be internet based, generally inexpensive to maintain, and technologies will be referenced via analyte, deployment method, maturity, etc.

Promises and Uncertainties of Integrated Risk Assessment Biosensor and Communication Technologies for Long-term Stewardship

Doug Meffert, Center for Bioenvironmental Research at Tulane and Xavier Universities

The objectives for the Center for Bioenvironmental Research's (CBR) long-term stewardship were outlined: participation in research agenda development; use of basic and applied research for technology development; performance of risk analyses in coordination with DOE and stakeholders; and further social science research and risk communication. Information on chemical data on the objectives and progress of studies for the dragonfly as a biomarker of pollution were provided. Specifics on another study, the endocrine-disrupting chemical in birds, was also presented. Additional information on the chemical impacts on symbiotic interactions and CBR biosensors was part of the presentation. The conclusion of the presentation addressed the promise and uncertainties of using biomarkers and biosensors and their involvement in long-term stewardship.

Field-deployable Radiation Detection Instruments for Characterization or Monitoring of Contaminants

David Roelant, Florida International University

The presentation began with the several questions. The first was "Who needs them?" (radiation detectors that is). The answer is that a variety of professions (health physicists, nuclear engineers, geophysicists, etc.). Questions related to technology needs, equipment availability, and performance requirememts were addressed. The presenter proceeded to address these questions. Characterization, monitoring, and sensor technology (CMST) was idenitified as the largest category of needs. These needs lack performance specifications thus making it difficult to develop something useful. Examples of CMST needs and performance specifications were identified, along with technologies that were already commercially available. Information was provided on the kind of resources available for measuring radiation and the number of technologies tested or developed. The sites need more efficient radiation monitors, better defined baseline practices, better cost and performance data, and better LTS requirements.

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Principles of Technology Integration for Success in Long-term Stewardship

Scott McMullin, U.S. Department of Energy, Savannah River

The presentation began with describing the DOE Environmental Management Program Approach/Evolution with declining Congressional Appropriations. It is no longer DOE's mindset to do everything, but rather concentrate on containment actions that are achievable and realistic. For the Department, it has become a question of Status Quo or New Paradigm, and what constitutes success. Is it a matter of integrating new goals and vision into an existing process? No! The answer is to learn to manage long-term risk and to measure performance data against a demonstrable end point. The significant point made in the presentation was that, "If you always do what you have always done, then you will always get what you've always got," so do something different!

Distribution of Moisture Monitoring System for Landfill Covers, A Fiber-Optic Approach

Jerry Peace, Sandia National Laboratories

Mr. Peace presented the research being performed to provide the Mixed Waste Landfill at Sandia National Laboratory with a landfill cover monitoring system. For long term monitoring of landfill covers, an essential component is the determination of the fluid flux or water balance through the cover. Research at Sandia is centering on a high spatial density system emplaced horizontally along cover layers as constructed. A distributed-thermal optical fiber system is being coupled with the baseline neutron moisture logging system to create a robust and low cost moisture monitoring system. The optical fiber system for landfill monitoring consists of a continuous line of optical fiber and protective stainless steel tubing which is emplaced along horizontal layers in the landfill cover and a mobile monitoring system. As the water content of soil increases, so does the thermal conductivity. When constant power is dissipated from a line heat source, in this case the electrical current through the stainless steel tubing, the temperature increase near the heat source will depend on the thermal conductivity of the material surrounding the heater. This method is similar to electrical thermistor-based methods. This continuous fiber optic system permits distributed moisture measurements compared to point measurements and provides a robustness and life-span similar ro buried fiber optic telecommunications systems.

An Alternative Closure and a Performance Monitoring System for a Mixed Waste Unit at the Nevada Test Site

Thomas Fitzmaurice, Bechtel Nevada

Mr. Fitzmaurice discussed the deployment of a mono-layer evapotranspiration (ET) closure cover at the U-3ax/bl mixed waste disposal unit located within the Area 3 Radioactive Waste Management Site at the Nevada Test Site. Various cover designs were evaluated based on the physical form of the buried waste, expected subsidence, estimates of water filtration and other environmental conditions. The study concluded that the only cover system which adequately addressed all of the performance objectives was the mono-layer ET cover. Regulatory approval for installation of the ET cover, rather than the traditional Resource Conservation and Recovery Act multi-layer cover, was contingent on installation of soil water content sensors within the cover to monitor performance during the post-closure monitoring period.

A performance monitoring facility was constructed adjacent to the U-3ax/bl mixed waste disposal unit. The facility is comprised of eight drainage lysimeters with three surface treatments: two were left bare, two were revegetated with native species, two were allowed to revegetate with invader species; and two are reserved for future studies. The lysimeters were constructed so that drainage from the bottom could independently be collected and measured. An array of 16 sensors was installed in each lysimeter to measure soil water content, soil water potential, and soil temperature. The various surface treatments, along with the automated measurement system, allow for a detailed evaluation of cover performance.

Long-term Capping Strategy and Technical Program

Mike Serrato, Savannah River Technology Center

Mr. Serrato discussed the goals and the technical approach for the long-term capping and surface containment systems. The goal of the long term capping strategy is to develop surface capping design and implementation guidance for DOE End-Users that is supported by regulators and stakeholders to assure cap performance that limits contaminant migration consistent with long-term, risk-based performance criteria for contaminated waste sites. Long term performance is an unresolved technical issue requiring the ability to design and construct a surface barrier system containing the performance attributes for long term durability in time frames greater than 100 years. To resolve this technical issue, improved design and construction practices, along with an integrated verification and monitoring scheme must be developed. Mr. Serrato confirmed that the Subsurface Contaminants Focus Area is providing the technical leadership to address these long term capping system issues through the Long Term Capping Technical Program.

Solving the RCRA Riddle through Innovative Landfill Closure

Charles V. Park, Bechtel Babcock and Wilcox Idaho

Mr. Park discussed the decision to close the Old Waste Calcining Facility at Idaho National Engineering and Environmental Laboratory (INEEL). The facility had processed Navy nuclear fuel for 40 years. When the decision was made to close the facility, INEEL evaluated several closure options and finally decided on a very innovative strategy of near term landfill closure with ground water monitoring, utilizing the building as part

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of the cap. Program success was credited to effective coordination with regulators, a cost-effective method to estimate the degree of risk, qualifying a building as an equivalent landfill cover, and implementing near term post closure care.

Performance Evaluation of the Lakeview, Oregon, Uranium Mill Tailings Disposal Cell Cover

W. Jody Waugh, MACTEC-ERS

Mr. Waugh discussed the Long Term Surveillance and Maintenance Program which is being managed by DOE's Grand Junction Office. The program is responsible for stewardship of sites remediated under the Uranium Mill Tailings Radiation Control Act of 1978 and other "orphan" low-level radioactive waste disposal sites in the United States. Innovative approaches to address the unprecedented 1,000 year longevity standard for uranium mill tailings disposal units are being evaluated. The Lakeview, Oregon disposal cell cover consists of four layers: a 45-cm compacted soil layer (CSL) over the tailings, a 15-cm drainage layer, a 30-cm rock layer, and, on the topslope, a 15-cm topsoil layer. Observations of crumbling rock and woody plant encroachment led to an evaluation of cover performance. Yearly monitoring indicates that the average rock size may soon drop below the design specification for erosion control. More robust erosion calculations that incorporate field infiltration data suggest that smaller rock may be acceptable. Furthermore, evaluations of natural analog slopes may indicate that rock is unnecessary for long-term stability. The saturated hydraulic conductivity of the CSL, as measured with air-entry permeameters, exceeds the design specification, is highly variable, and is only indirectly related to root intrusion. Instead, construction practices and freeze-thaw cycles may contribute to the increased hydraulic conductivity. Analog data suggest that the leaf area index for cover vegetation could increase tenfold in fifty years. Drainage estimates based on these and other water balance parameters will be input to a risk assessment.

Full-scale Deployment of Waterworks Crystals® Aqueous Waste Solidification Technology

Kurt Colborn, Earthline Technologies

Waterworks Crystals® are a super absorbent, organic polyacrylac resin designed for remediation and waste management tasks. The crystals can bind and solidify over 100 times their weight in contaminated water with little or no volume growth. They can be used for spill residues, high moisture content waste, trench or tank cleanout, and asbestos abatement.

About 10 pounds of Waterworks Crystals® are generally applied to a 55-gallon drum of aqueous waste. No mixing is required, solidification is complete in about five minutes, and there is no noticeable volume increase. This results in a single waste profile for waste that has aqueous and non-aqueous components. The costs of handling, treating, shipping and burying the solidified drum is typically less than $7 per gallon.

Mr. Colborn presented a poster on the deployment of this technology at the Miamisburg (Mound), Ashtabula, West Valley and Laboratory for Energy Related Health Research (LEHR) sites. In all cases, the resultant, Jell-O-like solid passed the USEPA Paint Filter Test (PFT), both at the time the waste was shipped and when it was received at the disposal site. It is accepted at the Nevada Test Site, Envirocare, and Hanford disposal sites.

At Ashtabula it was applied to seven waste streams including sanitary sludge, PCB mud, trench residues, and soil washing plant residues. Solidification of basic processing "gray-waters" required ratios of 2 wt% - 5wt%. More contaminated, brackish, mineral based soil washing plant residues required 10wt% - 20wt%. After demonstrations were successful, the contractor changed the baseline and deployed this technology, which resulted in savings of about $40,000.

At LEHR the crystals were added to underground tanks holding radioactive wastewater and soil that resulted from daily maintenance of research kennels. The slurry/sludge solidified with the addition of about 4wt% Waterworks Crystals®.

At the West Valley Demonstration Project, Waterworks Crystals® were added to drums of waste water plant sludge containing Cs-137/Sr-90 in concentrations up to 74,000 pCi/g. The sludge (less that 10wt% solids) was solidified directly in the drums. Without mixing, this process took about fifteen minutes.

Many DOE sites have brackish aqueous sludge waste streams, and could potentially benefit from this nontraditional technology.

The Integrated Waste Tracking System (IWTS) - A Comprehensive Waste Management Tool

Bob Anderson, Idaho National Engineering and Environmental Laboratory

IWTS was developed at the Idaho National Engineering and Environmental Laboratory (INEEL) as a comprehensive "cradle to grave" waste tracking system. Prior to development of IWTS there were about 42 waste tracking systems with no consistent compliance evaluation methods. IWTS is a platform-independent, client-server and Web-based inventory and compliance system. In addition to INEEL (including Argonne National Laboratory -West and the Naval Reactors Facility), IWTS is used at the West Valley Demonstration Project and is currently being deployed at the Oak Ridge Reservation.

Mr. Anderson, the IWTS System Engineer, presented a poster detailing the system development. The objectives were to provide a consistent compliance evaluation across INEEL, ensure data ownership by the operations people, provide data near real-time, and meet all tracking and reporting needs. Personnel involved in generating waste, shipping/transport, facility support, compliance, processing and management all use IWTS. INEEL has used IWTS for over six years.

IWTS includes facility models that represent the appropriate hierarchy of site-specific structures. Waste characterization information is applied to each container. Containers may be scanned for identification purposes with wireless, handheld devices. Shipments, treatment processes (e.g. incineration, compaction) and disposals are also modeled. Each container profile provides a task history and graphical genealogy. Hazardous Waste Manifest reporting is also included. IWTS is a single source for data that has eliminated duplicative data entry and the proliferation of multiple systems.

Modification of FWENC Stabilization Process to Enhance Leach Resistance in Radioactive Tank Sludges

John W. Barton, Oak Ridge National Laboratory

John Barton and Roger Spence of Oak Ridge National Laboratory (ORNL) performed an independent verification of a process developed by the Foster Wheeler Environmental Corporation (FWENC) for stabilization of Oak Ridge tank sludge. The purpose was to verify compliance with Waste Acceptance Criteria (WAC) and storage needs prior to shipping the final waste forms. The stabilization approach tested was designed to remove free water and immobilize RCRA contaminants using additives. Toxicity Characteristics Leaching Procedure (TCLP) performance tests were used to determine the success of the procedure.

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FWENC developed the procedure for the Melton Valley storage tanks. These are eight 500,000-gallon underground tanks containing sludge and supernate with about 20,000 curies of radioactivity. When stabilized, the sludge will be sent to WIPP and the Supernate will go to the Nevada Test Site. The FWENC stabilization process involves adding two chemical agents and vacuum drying the waste at 80°C.

The TCLP tests for stabilization of RCRA-regulated metals found that the process did not work; the final waste form did not comply with the WAC. Cadmium was stabilized, but leaching of mercury and chromium was not prevented.

Onsite Treatment of Multiple Mixed Waste Streams to Meet Regulatory Milestones

Kurt Colborn, Earthline Technologies

The Ashtabula Environmental Management Project (AEMP) must stabilize and dispose of 233 m^3 of mixed waste. The presence of enriched uranium and graphite presented challenges in complying with Waste Acceptance Criteria (WAC). The solution was on site treatment using macro and micro encapsulation.

The macro encapsulated waste included electrodes, lead batteries, HEPA filters, and D&D debris. Some was contaminated with graphite and 2wt% enriched uranium. The waste is first sorted, and pieces larger than 60 mm (2") are compacted into a cage and dried. The cage is put inside a drum and a plastic extruder deposits low density polyethylene plastic over the waste. The cage ensures that the required margin between the waste and the drum wall exists. The final form is a monolith of polyethylene and debris. Envirocare ensured compliance with WAC by inspecting the process at AEMP. Initially there were some problems with the plastic cracking. Using a lower viscosity plastic and cooling the debris more slowly solved this.

Each drum costs roughly $2,000. It takes about two man-hours to fill the drum, and about three days for it to cool. Capital costs were very low because the extruder was acquired as excess equipment from Rocky Flats.

Micro encapsulation is used for graphite residue, barium salt, and floor sweepings. Some of this was also contaminated with graphite and 2 wt% enriched uranium. Preparation of this waste involves grinding it to less than 3 mm, adding some necessary chemicals and drying the waste. The barium salts required extra additives to stabilize. The batch-fed extruder produced strands of encapsulated waste about one-half inch in diameter. Most of the micro encapsulated waste was not mixed, and therefore sent to NTS. In the beginning, some of the micro encapsulated waste forms did fail because of the additives; they were ground up and fed through the extruder again. Kurt recommended extra time upfront to confirm additive concentrations to avoid this problem.

Transportable Volume Reduction System for Square HEPA Filters

James Voss, Terra Verde Services Ltd.

Mr. Voss reviewed a transportable HEPA filter shredding system. Traditionally, at power reactors in the UK, one square HEPA filter and bag were placed in one 55-gallon drum. The drums were than compacted, grouted and disposed of as low-level waste. The majority of this waste volume was not the contaminated HEPA filters, but rather the barrels and grout. To increase the efficiency of square HEPA filter disposal, Terra Verde designed and licensed a portable shredder that enables four or five filters to be disposed of in each drum.

The system is on a trailer so that the filters can be shredded onsite. The twin-screw shredder was built for much harder materials and has not experienced technical problems. The process requires two workers. The last step in the process is decontaminating the system with high-pressure air through a HEPA filter. This filter is left at the site, and shredded at the next pick-up. The trailer undergoes complete liquid decontamination as part of routine maintenance.

This process saves power plant operators time and money by shredding the filters on site. It has also saves landfill space by reducing the number of barrels generated.

Use of Low-Flow Sampling Technique for Compliance Ground Water Monitoring at RCRA Facilities in New Mexico

Victoria M. Maranville, New Mexico Environment Department (NMED) - Hazardous Waste Bureau (HWB)

Ms. Maranville discussed the use of low-flow verses traditional purge and sampling techniques at RCRA permitted facilities in New Mexico.

Many RCRA sites in New Mexico use a traditional method of well purge and sampling, which involves removal of a specific pre-calculated number of well volumes from the monitoring well prior to sample collection. Due to rising disposal costs, some RCRA permitted facilities in New Mexico are looking for ways to reduce the volume of water produced during purging and are exploring alternative sampling techniques. The NMED HWB has developed guidance for the regulated community regarding low-flow sampling methods.

Low-flow is related to the amount of drawdown in a well during purging and the rate at which the well is purged. During the purging process indicator parameters are collected and allowed to stabilize prior to sample collection. Using a traditional sampling technique, generally three to five well volumes are removed and indicator parameters may be monitored and allowed to stabilize prior to sample collection.

In order to consider low-flow purging and sampling, the well must meet various selection criteria outlined by NMED HWB. Since the low-flow paper is guidance, variations are allowed on a case-by-case basis and must be submitted in writing to HWB for approval prior to implementation.

The low-flow purge and sampling technique is site-specific and has been developed to eliminate some of the potential problems associated with traditional sampling methods including: reduction in the amount of purge water generated, resulting in a reduction in disposal costs associated with purging a well, and a reduction in sample turbidity eliminating the need for filtration. Traditional sampling can produce samples with increased turbidity resulting from agitation or mixing of the well water; may mobilize colloids which may not be mobile under natural conditions; may generate large volumes of purge water, especially in large diameter wells; and the purge volume calculation is not site-specific.

For more information and specific details, contact Victoria Maranville at 505-428-2532 or vickie_maranville@nmenv.state.nm.us. An electronic copy of the guidance can be found http://www.nmenv.state.nm.us/HWB/guidance.html.

Characterizing Cumulative and Mixtures Risk

Margaret MacDonell, Argonne National Laboratory

Ms. MacDonell discussed characterizing various contaminants at the Hanford site and the associated risks to develop solutions for safe management of contaminated materials in both near-term protection of workers and local residents as well as long-term protection of the community. At Hanford, contaminants in the ground water, vadose zone, and the tanks have been of concern to stakeholders and oversight agencies. Information on the potential for synergism as well as health effects beyond the critical effect have been identified as elements of an expanded health risk assessment.

Although evaluation methods and toxicity data for mixtures continue to evolve, they have not yet been applied to complex risk assessments for contaminated sites. This project is developing initial steps for applying mixtures assessment approaches to the Hanford site. A general flow diagram has been prepared to first assess the need for a mixtures assessment as part of the scoping process. If the answer is yes, the first evaluation phase addresses the environmental component. This phase consists of contaminant sources and ongoing or predicted releases along with environmental distribution of contaminants in specific media at measured or predicted concentrations. Also included in this first phase is the identification of land/resource use and key receptors and their exposures. Receptors can range from off-site residents and recreational visitors in the general area to on-site workers. Key receptor characteristics that may affect susceptibility to toxic effect include diet/lifestyle, age, gender, body burden, disease status, and polymorphisms. Also important to identify are the timing and sequence of reasonably likely exposures.

Using the first phase to focus on the environmental contaminants and media of priority consideration for key receptors, the second phase addresses the toxicity and compliance component. Toxicity data for single chemicals and mixtures (where available) are evaluated in addition to existing risk-based regulations to further focus the contaminants of priority concern for the mixtures assessment. This second phase includes a concentration/toxicity screen together with information on absorption, distribution, and retention in the body; the target system/organ and critical effects as well as secondary organs and effects; and modes and mechanisms of action. Repair and effect recovery data are also relevant to this phase, considering both the time to recovery and its nature (such as whether full organ/tissue function is restored and whether sensitiza-

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tion is indicated that would result in a lower response level for subsequent exposures). The outcome of this second phase is a grouping of contaminants by system/organ and effect to highlight overlaps that indicate an opportunity for interaction, together with a weight- or lines-of-evidence characterization of potential risk concerns. The overall characterization will be a combination of qualitative and quantitative data. Contaminants of concern to stakeholders for which toxicity data are unavailable will be maintained on a watch list, to be revisited when our scientific knowledge can provide the relevant information.

The initial framework for screening and grouping contaminants to identify opportunities for interactions has been developed, an example figure has been prepared for distribution in the body; target system/organ and critical effects have been assembled for selected contaminants; initial data have been compiled for secondary effects; and standard toxicity data have been summarized to support single-contaminant screens. Also, an umbrella conceptual model has been developed to help link information across risk types. This conceptual model has similar categories for health, ecological, sociocultural, and economic risks, with risk information and stakeholder perceptions providing a bridge between health and ecological risks and related sociocultural and economic impacts. This information is being used to help focus the initial stage of mixtures assessments for the Hanford site.

For more information and specific details, contact Margaret MacDonell at 630-252-3243 or at macdonell@anl.gov, or contact Doug Hildebrand, U.S. Department of Energy Richland Operations Office, at 509-373-9626.

Ground Water Investigations to Support Environmental Decisions at Los Alamos National Laboratory

Charles L. Nylander, Los Alamos National Laboratory (LANL)

Mr. Nylander discussed LANL's Hydrogeologic Characterization Program, problems encountered during implementation, resulting solutions, and the programs' influence on environmental decision-making. The main objective of LANL's Hydrogeologic Characterization Program is to develop an understanding of the hydrogeologic setting beneath LANL so as to enable the adequate design and implementation of a ground water monitoring network. The program is focused on identifying saturated zones, flow direction and velocity, affects of fractures and faults, geochemistry of aquifer materials, the hydrogeologic connection between saturated zones, and to collect high quality hydrogeologic and geochemical data.

During implementation of the Hydrogeologic Characterization Program various problems related to the drilling method arose, including the need to use casing advance to maintain an open borehole during air rotary drilling. The drilling approach selected was very slow and expensive; therefore LANL optimized the drilling method by using open hole drilling in competent rock and using casing only as necessary. The original drilling plan required perched ground water zones to be sealed off as they were encountered during drilling to prevent cross-contamination. Unfortunately, more perched ground water zones were encountered than anticipated. Attempts to seal off all encountered perched zones were resource intensive and in many cases not very successful. The solution was to install the boreholes more quickly, minimizing the commingling of multiple perched ground water zones.

The original drilling plan included the characterization of perched intermediate ground water zones as they were encountered during the drilling process. Based on the actual field activities it was determined that stopping and starting of drilling activities to characterize intermediate perched ground water was expensive and unsuccessful. In addition, the data collected was treated by the regulatory agency as "screening data" and not used for regulatory compliance decisions. In attempt to collect high quality data that could be used for regulatory decision-making, multiple completion wells were installed with screened intervals in encountered perched zones. The multiple completion wells allowed characterization without delaying the drilling process.

During the implementation of the Hydrogeologic Characterization Program borehole drilling and well construction disturbed the natural system and may have resulted in ground water zones being cross contaminated. Drilling additives used during the drilling process may have potentially affected the geochemical characterization sample results. In both instances solutions were implemented that: utilized indicator parameters; avoided basing decisions on a single sample result; and that allowed for a "well equilibration" period prior to obtaining samples that were more representative of the native ground water.

LANL has recognized that making characterization decisions based on a single measurement can lead to unnecessary actions and expenditure of resources. In addition, data collected during drilling activities can be used to calibrate and validate the ground water models used by LANL and may help refine the drilling process for future boreholes and monitoring wells.

For more information and specific details, contact Charles Nylander, LANL Water Quality and Hydrology Group, at 505-665-4681 or nylander@lanl.gov, or contact David Broxton, LANL Hydrology, Geology and Geochemistry Group, at 505-667-2492 or Broxton@lanl.gov.

Use of Borehole Geophysics for Hydrogeological Characterization at Los Alamos National Laboratory

David E. Broxton, Los Alamos National Laboratory

David E. Broxton of Los Alamos National Laboratory (LANL) discussed borehole geophysics at LANL. The increased use of geophysics results in part from changes in drilling techniques that provide access to long sections of open borehole, maximizing the number and types of tools that can be deployed. The evolution from air-assisted casing-advance drilling to fluid-assisted open borehole drilling has also led to the use more

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geophysical logging to identify perched ground water zones. Most wells installed at LANL contain multiple screened intervals. The screen placement relies on integration of geophysical and video logs, and lithologic information from drill cuttings.

In open boreholes at LANL, the suite of logs commonly collected includes: spectral gamma for mineralogy and lithology; nuclear magnetic resonance for porosity (total and effective), moisture content of the vadose zone and hydraulic conductivity of the saturated zone; electrical induction with five depths of investigation for fluid invasion and lithologic correlation; density logging for bulk density and lithology; epithermal neutron for moisture content in the vadose zone and porosity in saturated rocks; and electrical imager for oriented sedimentary and structural features and measuring borehole deviation. Video logs are also used to supplement geologic information derived from drill cuttings. The suite of tools used is evaluated on a well-by-well basis to meet data quality objectives of a particular site.

The logging contractor performs data processing, quality evaluation, presentation, and preliminary interpretation of geophysical log data. The preliminary interpretations are further refined through exchange of site-specific information with onsite geologists and hydrologists about the lithologies, ground water occurrences, and borehole conditions encountered during drilling. End users of the data include the technical team that designs and builds the wells as well geologists, hydrologists, geochemists, and modelers.

Borehole geophysical data provides near real-time data to make drilling and well construction decisions. Geophysical logging can also provide useful information about moisture distribution, porosity, and degree of saturation to supplement other direct sampling techniques used to characterize the subsurface at LANL.

For more information and specific details, contact David Broxton, LANL Hydrology, Geology and Geochemistry Group, at 505-667-2492 or broxton@lanl.gov, or contact Richard Lewis, SchlumbergerSema, Utilities Integrated Water Solutions, at 303-566-6812 or lewis2@slb.com.

Hydrochemical Characterization at R-15, Mortandad Canyon, Los Alamos National Laboratory

Patrick Longmire, Los Alamos National Laboratory

Patrick Longmire of Los Alamos National Laboratory (LANL) discussed impacts of the Cerro Grande fire on several major watersheds that drain into the LANL Facility. The watersheds include Pueblo Canyon, Los Alamos Canyon, Sandia Canyon, Mortandad Canyon, Pajarito Canyon, and Water Canyon.

Ash produced from the fire consists of a complex mixture of inorganic and organic compounds. Calcium, magnesium, silica, potassium, sodium, and carbonate are concentrated in the ash, producing alkaline pH values typically ranging from 9 to 10.5. During storm events, the ash is washed into canyons and is carried down stream. Alkaline pH values may persist in runoff water because rainwater at Los Alamos is characterized by pH values ranging from 5.5-6.5. Rainwater has a limited buffering capacity because it is depleted in base cations and anions including calcium, magnesium, potassium, sodium, and bicarbonate.

During storm events, surface water typically recharges alluvial ground water, which in turn, recharges deeper perched ground water. Changes in pH and major ion water chemistry induced by the ash-rich runoff and surface water may influence the distribution and mobility of contaminants including strontium-90, uranium, plutonium, and americium. Strontium-90 is the contaminant of concern in upper Los Alamos Canyon, whereas the other contaminants are found in Mortandad Canyon. Calcium competes with strontium-90 through cation exchange and adsorption reactions, in which calcium displaces strontium-90 to solution. Under alkaline pH values, strontium complexes with bicarbonate forming 90SrHCO31+, which does not adsorb as strongly as 90Sr2+. This cation is stable under near neutral pH conditions typical of surface water prior to the Cerro Grande fire. Elevated activities of strontium-90 and other contaminants could be observed in surface water and alluvial ground water samples collected during storm events, especially in June and July 2000.

For more information and specific details, contact Patrick Longmire, LANL Earth and Environmental Sciences Division, at 505-665-1264 or plongmire@lanl.gov.

Dose-Based Radiological Limits for Free Release of Property

Jeffrey W. Lively, MACTEC-ERS

General direction and specific examples deployed at the Department of Energy (DOE) Grand Junctions Office were provided on the processes of obtaining radiological free-release limits for decommissioning based on the risk (dose) to individuals in the future use of property. Dose-based limits are applicable to both buildings and soil and can be derived to eliminate conditions or restrictions for future use. The approach presented is a departure form the long-standing historical prescriptive method of default concentration limits provided in DOE Order 5400.5, but is supported by DOE, the Nuclear Regulatory Commission, and the Environmental Protection Agency. In order to be successful, stakeholders and regulators need to be involved early in the process. In addition, high-quality conceptual site models need to be established and all reasonable uses for 1000 years need to be identified. This process involves both science and politics, and has the capability to significantly reduce costs that otherwise would be dedicated to cleaning up property without a measurable reduction in dose.

Analysis of Temporary Shielding Systems

James S. Voss, Terra Verde Environmental, Inc.

This presentation focused on the design of a portable shield system for reactor component decontamination and decommissioning in the UK. MRP Systems Ltd. of the UK selected Terra Verde Environmental to conduct this study. The shielding dimension requirements were for a ten by ten meters three-sided enclosure five meters in height. The shield material consists of hollow polyurethane blocks (1m x .75m x .5m) that are stacked like large "Lego™ blocks". The stacked hollow blocks are then filed with a sand and water slurry mixture. A strippable coating can be applied to the inside of the three-sided structure. Verification of shielding properties was performed by the University of Arizona via a "hot" test. A crew of four using a light overhead crane is able to erect the entire assembly in approximately 32 hours and remove the system in 26 hours. Four man-hours for coating application in "hot" environments and four man-hours for removing the coating in "hot" environments are required. Waste generation includes personal protection equipment, the strippable coating (estimated to be less than one drum), the uncontaminated sand/water mixture, and block decontamination if needed. The blocks are reusable, having a five-year life. Estimated costs were reported to be very reasonable.

FIU-HCET D&D Technology Programs in Support of the EM-50 D&D Focus Area

John Laffitte, Florida International University Hemispheric Center for Environmental Technology

Florida International University Hemispheric Center for Environmental Technology (FIU-HCET) objectives are to identify, develop, integrate, and deploy innovative decontamination and decommissioning technologies through research and development, technology assessments, and technology transfer. Several technology development projects were reviewed, including the 1) Los Alamos Crate Size Reduction System, 2) Remote Environment Surveyor, 3) In-situ Pipe Decontamination System/Unblocking Tool, 4) Mobile Integrated Pipe Decontamination System, 5) Integrated Floor Decontamination and Characterization System, and 6) Integrated Vertical and Overhead Decontamination System. In addition, specific examples of technical support services to Hanford, Savannah River, Los Alamos, Fernald, Mound, and Idaho were reviewed.

Identifying Solutions for Site Needs Using the D&D Information System

Thea E. Reilkoff, Energy and Environmental Research Center

The Decontamination and Decommissioning Information System (DDIS) was developed by the Energy and Environmental Research Center (EERC) to identify and match technical solutions to specific site needs. There are over 500 innovative technologies in the system, including Office of Science and Technology (OST) developed technologies and non-OST developed technologies. The sites identify their needs, including problem descriptions, schedule information, current baseline technologies, functional performance requirements, and contract information. Technology descriptions include vendor(s) contact information and Web links. Needs and technologies are matched through a priority structure based on problem area, media, remedial objective, and contaminant. Search capabilities are based on one or a combination of fields. DDIS should be available on the Web by March 2002, and will be in a user-friendly format that will be accessible not just to DOE but also to vendors, private industry, and the general public. This new system allows technology developers and vendors to bring forward potential solutions to problem sets by submitting requests to be added to the database.

Use of Modern Project Management Techniques for the Hydrogeological Characterization Project at Los Alamos National Laboratory

Ted Ball, Los Alamos National Laboratory (LANL)

Mr. Ball gave a presentation on how projects are initiated and the interaction of the planning, controlling and execution of the project prior to project closeout. During the planning phase, the activities include identifying the scope and developing the work breakdown structure (WBS). Also, a good project management technique is to develop bottoms up cost estimates, and at LANL, these project estimates were developed using historical data from initial wells. As part of the cost estimate, risk assessment and contingency analysis is performed. After the scope and cost, the schedule is developed using a detailed list of activities where the duration and resources are based on actual cost of wells. During the project execution, LANL tracks the projects using monthly variance analysis on what the variances are, why there are variances, and what can be done to correct the variances. The Baseline Change Control board is utilized for scope, cost, and schedule changes. The result of the LANL project management approach is that this project has positive cost and schedule variance, and is within two percent of the allocated budget. For more information, contact Theodore Ball, at (505) 665-3996 or tedball@lanl.gov.

Hanford River Protection Project - Project Control

Peter Furlong, Office of River Protection (ORP)
William Kitchen, CH2M-Hill

The ORP project involves the storing and retrieving, transportation, and treatment of the highly hazardous and radioactive waste from the tanks; and the storage and disposal of the vitrified waste. To manage this multi-billion dollar project, CH2M-Hill uses the Project Delivery System that includes clearly defining work to be performed, how the work will be accomplished, using the right tools and measurements, and alignment of organizations. To track and manage project, ORP and CH2M-Hill uses the scope-driven WBS to develop the scope, cost and integrated schedule, uses the earned value management system (EVMS), and has a comprehensive risk management process that spans all project participants. Specifically, the risk management involves risk identification, quantification, prioritization, and risk control and mitigation. Additionally, the project management approach also emphasizes the integration of work and activities between contractors involved in the project. Further, the ORP maintains, measures, and analyzes the performance through critical path analysis and use of issue oriented EMVS. In order to achieve the goal of protecting the Columbia River in a safe and cost effective manner, the ORP is committed to strong and effective project controls system. For more information, contact Peter Furlong at (509) 372-1738 or peter_t_furlong@rl.gov.

Idaho National Engineering and Environmental Laboratory (INEEL) Pilot Project: An Integrated Approach to Accelerate Facility Disposition

Patrick L. Gibson, Bechtel BWXT Idaho LLC

Mr. Gibson started the presentation by giving a brief overview of the problems at INEEL and across the DOE complex. The repetitive common nature of facility closure offers opportunity to improve performance over time. By applying systems engineering approaches, by identifying high risk and high cost activities, by sharing of lessons learned and using of learning curve principles, achievement and performance of objectives can be greatly improvement. The value of the INEEL approach has been demonstrated by having better technical baseline and realizing cost savings and cost improvement. For more information, contact Patrick Gibson at (208) 526-1379 or gibspl@inel.gov.

Laboratory Selection Using the Best Value Concept

Joe Pardue, NFT, Inc.

Mr. Pardue gave a presentation on selecting the right laboratory for performing sample analysis and providing project support. Some of the metrics that should be used to measure laboratories include sample turnaround time (TAT), holding time (HT), contract compliance verification (CCV), and performance evaluation (PE) sample results. These metrics are used to calculate the Performance Indicator Factor which is equal to 0.60 TAT+ 0.20 HT+ 0.1 CCV + 0.10 PE. The total laboratory analytical cost plus the estimated shipping cost divided by the Performance Indicator Factor determines the best value added score. The laboratory with the lowest best value added score is selected for the individual statement of work. This approach not only considers performance, but rewards good performers. For more information, contact Joe Pardue at 865-576-9881 or parduej@nftinc.com.

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Waste Management Program Plan for Oak Ridge Reservation (ORR) CERCLA-Generated Waste

John E. Patterson, Bechtel Jacobs Company LLC

Mr. Patterson gave an overview of the ORR, the type and amount of waste generated at the site, and the treatment and disposal options for the waste. Based on analysis performed, it was determined that ORR Environmental Management Waste Disposal Facility (EMWMF) is most cost effective for radioactive waste disposal. The Y-12 Landfill is most appropriate for debris waste, Nevada Test Site for waste that does not meet the EMWMF waste acceptance criteria, and Envirocare is an option for debris and mixed waste. At ORR, the best management practices are to reduce volume of D&D waste requiring management as a regulated radioactive waste, economize on the soil-to-debris ratio for the EMWMF, effectively utilize the EMWMF, and explore treatment options for waste generators. For more information, contact John Patterson at (865) 241-2558 or o8x@bechteljacobs.org.

Challenging the Cost of Infrastructure Maintenance at the INEEL through Risk-Based Forecasting

Alfred J. Unione, Enercon Services, Inc.

Mr. Unione provided the background and overview of the INEEL and the Maintenance Management Program (MMP). The MMP is implementing a cost reduction initiative through a risk-based asset sustainment process, and the use of the Facility Infrastructure Sustainment Cost (FISC) model. The FISC forecasts costs based on facility condition, "value" of facility operations, importance to mission, health and safety index, cost of compliance, remaining useful life, and other data. The FISC has been used to forecast FY 02 maintenance budget for INEEL, to categorize maintenance costs by activity types, for long-term planning, optimization of activities, and to find areas where cost can be saved. FISC is being realigned and refined for FY 03. For more information, contact Al Unione at 208-528-2831 or aunione@arescorporation.com.

Measuring the Use of Technology Applications in EM

Jeffrey S. Walker, Department of Energy - Headquarters

Mr. Walker gave a presentation on implementation and use of innovative technologies. Although the use of innovative technologies is increasing and gaining acceptance, much remains to be accomplished. The factors that have been influencing the use of new technologies include technology breakthroughs, strong and active science and technology programs, dedicated technology advocates, reduced budgets, and accelerated site closure schedules. Drivers that will impact the use of innovative technologies in the future include budget and schedule pressures, technology advocates, and incentives in contracts to use innovative technologies. Additionally, in deciding to use a technology, a project risk analysis must be performed. To assist the Field Project Managers with selection of technologies, Office of Science and Technology has formed technology assistance teams, focus areas, and HQ deployment assistance teams, and other groups and efforts to facilitate use of innovative technologies. For more information, contact Jef Walker at 301-903-8621 or jeffrey.walker@em.doe.gov.

In-Situ Thermal Destruction Makes Stringent Soil Cleanup Goals Attainable

Ralph S. Baker, TerraTherm, Inc.

In situ thermal destruction (ISTD) is the simultaneous application of heat and vacuum to improve soil vapor extraction for removal of volatile organic compounds (VOC) and enhance in situ oxidation and pyrolysis. TerraTherm Inc. has successfully applied this technology to eight sites with the following contaminates: PCB, PCE, TCE, gasoline, and diesel. The process works by using a thermal blanket covering the soil surface or a grid of heater-vacuum wells. By increasing the temperature of the soil by thermal conduction the vapor pressure of organic contaminants increase enough to improve vapor extraction efficiency and oxidation. This technique is particularly useful when dealing with contaminants that are highly weathered and highly sorbed to the sediment. Mr. Baker pointed out that it is not necessary to heat the soil to temperatures that are near the thermal destruction level for the contaminant since the vapor pressure increases enough at much lower temperatures to allow 99% removal of the contaminants by vacuuming the soil gas. Mr. Baker also showed that the oxidation and pyrolysis reaction rates were much higher for the ISTD process then hydropyrolsis using steam for polycyclic aromatic hydrocarbons (PAHs), tar and benzo-a-pyrene. The eight sites that TerraTherm has used this process on includes both clayey sites and sandy sites and it has been effective at these sites down to a depth of 20 ft. PCB concentrations as high as 20,000 ppm were reduced to less than 33 ppb. ISTD costs ranged from $100-400/cy for PCBs, pesticides and dioxins to $60-170/cy for BTEX, VOCs, and PAHs. The process is rapid, usually less than 2-3 months and typically achieves greater than 95% in situ destruction of contaminants.

Well Rehabilitation

Alan Coombs, Baroid Industrial Drilling Products

Rehabilitating wells are becoming much more attractive as a cost effective and greener solution. With new materials and techniques, it is becoming easier to restore wells to their original capacities or changing them into either better sampling points or as better production sources. Using existing wells can also decrease the footprint required for a remediation, and permitting delays that may significantly slow down a remediation schedule. Disposal of cuttings from installation of wells in contaminated sites and the undesirable biostimulation that can accompany drilling activities is also another reason for minimizing drilling of new wells. Mr. Coombs reviewed the chemical, biological, hydrological parameters that can decrease capacity and water quality. He pointed out that 80% of well fouling problems are biological. Strategies for well remediation include knowledge of components of well plugging, determining fluid penetration capacity, determining shock effects, and determining the local ground water chemistry and biology that may contribute or exacerbate the problem. High levels of minerals can accelerate deposition. Pumping wells can also draw in nutrients from the surrounding area, thereby creating a zone of biostimulation around some wells. Acidification is quite good as a remedy, but must be tailored to whether the fouling is chemical or biological. Mechanical agitation is also critical to the acidification process. Dislodged and dissolved deposits must be removed to complete the redevelopment of wells and insure the long-term rehabilitation of the well. Penetration into the surrounding formation is also critical to well rehabilitation. Finally, he suggested that we need to develop and apply long-term monitoring programs to enable the maximum life of the well for the purposes that it is being used.

Modeling of Two Biosparge Remediation Systems Operating at a Landfill

David C. Noffsinger, Westinghouse Savannah River Company

Savannah River has been operating two horizontal wells at a solid waste landfill to biotreat ground water contaminated with chlorinated ethenes from the landfill for the past two years. This 75-acre landfill was capped in 1996, though it was found that vinyl chloride and trichloroethylene in the ground water moving away from the landfill and towards as seep near a creek required treatment. The maximum observed ground water concentrations in point of compliance (POC) wells was 28.5 ppb for TCE and 2 ppb for VC. Treatability tests and pilot tests showed that these contaminants could be treated by injection of air with gaseous nutrients (methane, nitrous oxide and triethyl phosphate) to stimulate indigenous bacteria to cometabolically degrade the contaminants. The wells were placed to intercept the natural flow of ground water and create a zone of biotreatment. Within one year the TCE concentrations had dropped from a maximum of 201 ppb to less than a maximum of 15 ppb for TCE. However the VC concentration increased during the same period from 46 ppb to 85 ppb. This suggests that a significant amount of reductive dechlorination was occurring despite the injection of air. A

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three phase modeling analysis was begun to assist the remediation effort. Phase I was intended to predict the performance of the biospraging system before operations and help in placement of new plume monitoring wells and predict overall operations. Phase II which began in 2000 determined if natural attenuation would be effective for handling the post treatment TCE/VC plumes or determine when it would be. Phase III was begun this year and attempted to determine the most effective injection schedules for the biosparging wells. By using three complimentary codes Mr. Noffsinger was able to establish the ground water flow field (MODFLOW), the bioactive zones stimulated by the horizontal wells (TRAMPP), and simulate the natural attenuation (NA) of the TCE/VC post treatment and in the seep areas prior to it reaching the creek (RT3D). The modeling has demonstrated the wells have a 75 ft zone of influence and that the wells need to be operated less than 5 years. The Phase II modeling showed that the cap had been very effective at limiting the source and that the wells had been effective at remediating both the TCE and VC but that changing plume distributions had caused the VC to appear higher in some wells. The Phase II modeling could not predict when NA would be an effective strategy. The Phase III modeling determined that an optimal injection schedule would include 24 hours of injection every four weeks, thereby decreasing cost while still meeting cleanup goals. Current tasks include predicting where VC hotspots are and if the biosparging system can be modified to treat these hotspots to allow faster system shut down.

Successful Risk Assessment at Sandia National Laboratories' Environmental Restoration Project

Tom Tharp, Roy F. Weston

Elements for successful implementation of Risk Based No-Further-Action Proposals include science based, regulator participation, and citizen input. Components include non-radiological and radiological human health risk assessment (HHRA), and ecological risk assessment. Guidance used was IRIS 1998, HEAST database 1997, and EPA Region VI, IX & II databases. The benchmark for Nonradiological HHRA was a hazard quotient index of < 1 and excess cancer risk of <1E-5. The Radiological HHRA benchmark used was calculated with the RESRAD computer code. The dose rate benchmark was 15 mrem/yr for industrial or recreational future land use and 75 mrem/yr for residential. Ecological risk assessment used the following receptors: generic grass, deer mouse, and burrowing owl. Nonradiological includes EPA and open literature benchmarks of HQ<1. The radiological ecological benchmark is 0.1 rad/day. Citizens Advisory Board (CAB) participation in the risk assessment process was critical to their buy-in and the success of the proposal. This process saved $200K at one site by using risk assessment instead of cleaning up to background. Savings were realized by sifting through the material and removing only the hot material instead of removing and disposing all 500 cy of soil at the site.

New Approaches to Solve Remediation Challenges Using Technological Applications at the Sandia National Laboratories' Chemical Waste Landfill

Chris Edgmon, Sandia National Laboratories

The Chemical Waste Landfill is undergoing remediation by removal of material from the old landfill, sifting and identifying chemicals in containers in the landfill and sorting them for proper disposal. This effort has resulted in a number of important lessons learned on how this type of project can be managed to minimize cost and insure worker safety. Mr. Edgmon presented four of the major issues: screening and debris segregation improvements, heat stress studies, explosion protection upgrades, and emergency planning. First the site used a truck bar screen that minimized personnel exposure; however it did little dust control, was slow, and was not effective for soil separation. Table screens with electric vibrators were then tried and resulted in better sorting, less container breakage and improved dust control. However, this method was labor intensive, had heat stress concerns and was slow. Finally a mechanical soil separator was used with better ergonomics, less heat stress, less noise, better dust control and increased productivity. However it did have high initial cost and maintenance. This hydraulic screening separator was coupled with a dome tent that was devised through employee input to improve ergonomics, provide from the weather, and, combined with a conveyor system, provide air line respirators and blast shields that greatly improved productivity. Heat stress issues were ameliorated by using VitalSense Telemetrics on each person to monitor heart rate, body activity, skin temperature and ear canal temperature. They also adapted use of Wet Bulb Globe Temperature (WBGT) indices to better regulate activity schedules. The heat stress study resulted in new work/rest guidelines, use of personal ice cooling vests and more training for all personnel on heat stress avoidance and first aid. They also implemented new blast shielding and installed blast shields in debris segregation tents. Emergency planning was facilitated by implementation of colored smoke as visual indicators of incident location and wind direction.

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Characterizing Unknown Chemical Materials from the Chemical Waste Landfill Excavation, Sandia National Laboratories, New Mexico

Mike Rose, Sandia National Laboratories (SNL)

The Chemical Waste Landfill at SNL is undergoing remediation by removal of material from the old landfill, sifting and identifying chemicals in containers in the landfill and sorting them for proper disposal. Mr. Rose stated that the coordinated goal of this project was to characterize excavated unknown chemical materials for commercial offsite disposal. This requires the identification of thousands of intact chemical containers. They have been very successful at this effort by using a methodical, graded approach, coupled with a dynamic process. By using a mobile HazCat Laboratory at the site they were able to greatly speed up the process. The characterization process begins with visual inspection of each chemical product for container integrity, past labeling, crystallization, physical properties and other visible characteristics that may have health and safety or identification importance. Once in the mobile laboratory, an iterative series of tests are performed for each chemical, where the next appropriate analysis is determined by the results of the preceding analysis. These analyses may include: XRF for elemental information, organic assessment, solubility in selected solvents, specific gravity measurement, chemical precipitation reactions, use of Drager colorimetric tubes, pH measurement, oxidation potential measurement, and testing for the presence of peroxides, cyanides, and sulfides. Field characterization of some chemicals may be confirmed or facilitated using the on-site laboratory capabilities. Containers are labeled and packaged appropriately for off-site disposal through the Hazardous Waste Management Facility at Sandia. Characterization information is collected on a container summary sheet that facilitates data review for waste disposal. Data is tracked in a searchable database so that previously identified materials can be used to identify other unknown materials.

Session VIII - Cap and Cover Designs

Optimizing Landfill Cover Thickness Using Predictive Modeling

Timothy Goering, GRAM, Inc.

Sandia National Laboratories used predictive modeling to develop a landfill cover design and thickness proposal for the Mixed Waste Landfill in lieu of a RCRA Subtitle C cap. The 2.6-acre landfill, a disposal area for low-level radioactive and mixed wastes operated from 1959 through 1988, contains approximately 100,000 cubic feet of waste. The objectives of the alternative landfill cover were to deploy a vegetated cover that was technically equivalent or better than a RCRA Subtitle C cap and that fully met the intent of Federal and State regulations and DOE orders. Three models were used to predict infiltration through vegetated soil covers: HELP-3, UNSAT-H, and VS2DT. HELP-3 was the simplest to use and the least robust numerically, but was also the least accurate. VS2DT was the least user friendly. UNST-H proved well suited for modeling the soil cover. Thicknesses of one to five feet were modeled. Two climate scenarios were modeled, a historical precipitation data set and a maximum data set. Modeling results for both scenarios predicted that the optimal thickness for the cover to be three feet. Increasing the cover thickness yielded limited improvement in cover performance but significantly increased construction costs.

Interstate Consensus on Regulatory Policy for Alternative Covers

Robert T. Mueller, New Jersey Department of Environmental Protection

The Interstate Technology Regulatory Cooperation (ITRC) is a state-led, national coalition of regulators and others working to improve state permitting processes and speed implementation of new environmental technologies. The goal of ITRC is to achieve better environmental protection through encouraging the use of innovative technologies, reducing the technical/regulatory barriers to the use of new environmental technologies, and building confidence about using new technologies. The group has been promoting the deployment, where appropriate and protective of human health and the environment, alternative covers and specifically evapotranspiration (ET) covers. For an ET cover to be effective, it must eliminate percolation through the landfill. Cover design requires adequate soil thickness to store water and sufficient root growth to extract water stored resulting from precipitation. In order to meet the design requirements, a variety of models and field data are used. ET covers are effective because natural system are less prone to failure and, as a result, ET covers are more protective of human health and environment than many other covers. In addition, design and construction times are typically less than conventional covers and have longer projected lives. Costs for ET covers were reported to range from $150,000 to $200,000 per acre. Optimizing landfill remediation has the potential for improved protection of human health and environment while providing longer-term landfill cap integrity, increased capacity, and large cost savings.

The Fernald Post Closure Stewardship Technology Project

Uday Kumthekar, Flour Fernald, Inc.

The goal of the Fernald Post Closure Stewardship Technology Project is to identify, demonstrate, and implement technologies capable of monitoring the On-Site Disposal Facility (OSDF) and any other facilities and restored areas that will remain after remediation is complete. Monitoring will ensure that systems are performing in accordance with functional requirements and provide early warning for potential corrective actions. An Integrated Stewardship Technology Team (ISTT) was formed in November 2000 to assist with the execution of work, provide project expertise, identify technology needs, screen and select technologies for demonstration, develop test plans and success criteria, and conduct and evaluate demonstrations. With the assistance of the ISTT, the OSDF Cell 1 Cover Monitoring System is scheduled for completion by December 2001 and will consist of 1) submersible pressure transducers to provide drainage layer head measurements and temperatures, 2) topographic surveys, settlement plates, and ground penetrating radar to monitor differential settlement, 3) dielectric water content sensors and matric potential sensors to measure soil moisture, soil-water potential, and soil temperatures, and 4) routine topographic surveys, visual and remote sensing, and web cams to supply visual observation of the cover system and buffer area. The highest FY 2002 priority is to develop an integrated data management and assessment system that is web based and with real-time reporting capabilities.

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Covering the Nevada Desert while Capping the Frozen Tundra

Monica Sanchez, U.S. Department of Energy, Nevada Operations Office and Dave Stahl, IT Corporation

The U.S. Department of Energy Nevada Operations Office oversees the environmental management and restoration of numerous sites in several states. Two of these sites, Amchitka Island, Alaska and the Central Nevada Test Area, have similar corrective actions: the remediation of mud pits contaminated with petroleum hydrocarbon and heavy metals resulting from drilling large diameter bore holes for underground nuclear tests. The remedial alternative chosen for both was to cap in place the mud pits. Amchitka Island, Alaska and the Central Nevada Test Area are both located in remote areas with extremely differing climatological settings, ranging from subarctic environments with 84 cm (33 inches) of precipitation to arid desert environments with 20 cm (8 inches) of precipitation. Prior to capping at Amchitka Island, water from the pits had to be removed, treated, and discharged. On-site sand and gravel were mixed with the drilling mud to produce material with adequate strength to support cap layers and stabilize the mud. The engineered cap consists of an intermediate soil cover, an anchor trench, a geomembrane layer, a protective soil cover, another soil cover (frost protection for the geomembrane), a vegetated layer, and an erosion blanket. The engineered cap at the Central Nevada Test Area consists of a vegetated monolayer cap with drainage control. Due to arid conditions, minimal preparatory work had to be done to the mud pits prior to cap construction. The remedial strategies addressed at both locations met site specific conditions, technical requirements, and regulatory requirements. These projects demonstrated the Department's technical capability to be diverse in remedial design requirements and strategies based on environmental conditions despite climate and remoteness.

Regulatory Acceptance of Monolayer Vegetative Cover for the Mixed Waste Disposal Unit U-3ax/bl at the Nevada Test Site

Jeffrey L. Smith, Bechtel Nevada

The U-3ax/bl Disposal Unit was created by joining two nuclear subsidence craters where radioactive wastes were disposed between 1968 and 1987. The wastes were subsequently covered with seven to nine feet of soil. Since U-3ax/bl contained hazardous wastes, Nevada Division of Environmental Protection (NDEP) closure approval was required. U-3ax/bl also contained low-level waste so the design needed to meet U.S. Department of Energy closure criteria, including a 1,000-year design life. In 1997, a study was conducted on closure covers and subsidence. The study concluded that a monolayer vegetative cover accommodated subsidence better than a traditional multilayer cover. Working directly with the regulators and stakeholders, a monolayer vegetative cover design that met all requirements was proposed and approved. The process was accelerated by anticipating NDEP concerns and preparing technical arguments and data that addressed these concerns during the planning process. The baseline and budget were also designed to support additional regulator interface and meetings.

Moving Beyond Demonstration: EPA-Sponsored Performance Verification of Field Analytical Technologies

Yvonne McClellan, Sandia National Laboratories (SNL)

The Environmental Technology Verification Program (ETV) accelerates acceptance and use of improved, cost-effective technologies. This is a partnership involving public and private customers, state and federal agencies, and consultant engineers. There are currently 6 ETV centers for performance verification of market ready technologies and about 60 technologies have been verified. It is coordinated through EPA-SITE, DOD ESTCP, and DOE-ITRD. Although this program has voluntary vendor participation, this is a credible program involving third party testing with rigorous protocols and test plans that are publicly available. The emphasis is on verifying technology performance; it is not an "R&D" effort or an "approval" process. Approval still has to be granted through the local regulatory process. A "verification statement" is given to the vendor if/when the technology is successfully tested to the established standards. Some examples of verified technologies include: portable gas chromatographs for field use, immunoassay kits, and field portable spectrophotometric systems used for organics and metals.

Microscopic and Physico-Chemical Characterization of Actinide Contaminants in Soils

Jeffrey A. Fortner, Argonne National Laboratory

Actinide bearing legacy wastes will require site specific solutions for storage and disposition. This reported work involved the use of scanning electron microscopy (SEM) and energy filtered transmission electron microscopy (EFTEM) to characterize waste streams containing plutonium and other actinides. Complementary chemical analysis such as particle size and isotope analysis will help in the characterization of sediments containing actinides and to identify the source term. Once the sediments have been characterized, decisions can be made to determine the type of cleanup strategy or the 'muck and truck' approach. When better characterization is performed on the waste materials, more costly cleanup strategies were shown to be inappropriate in most cases.

Hanford Tank Farm Vadose Zone Characterization Process and Results

Rick McCain, MACTEC Environmental Restoration Services

Spectral gamma logging systems with cryogenically cooled high-purity germanium detectors were developed and deployed in existing cased boreholes (~ 700) in the vicinity of the Hanford Tank Farms. Over a 5 year period, 125 tanks were spectrally logged in 12 tank farms with this system. The high resolution spectra allowed differentiation between natural and anthropogenic uranium and three dimensional visualization methods were used to determine the nature and extent of subsurface contamination in each tank farm. Data obtained are being used to identify locations for further investigations and to estimate contaminant inventories.

Comparison of Site Characterization Using In-Situ Gamma Spectroscopy, Laboratory Gamma Spectroscopy, ICP-Mass Spectroscopy, and Scanning GPS/Gamma Surveys at a Radiologically Contaminated Site

Mark L. Miller, Roy F. Weston, Inc.

Four characterization methods (in-situ Gamma Spectroscopy, Laboratory Gamma Spectroscopy, ICP-Mass Spectroscopy, and Scanning GPS/Gamma Surveys) were used to characterize a radiologically contaminated site at Sandia National Laboratories. These four methods were compared for relative accuracy, precision and efficacy. The ICP mass spectrometry method was as little as $50 per sample. A GPS system was hooked up to the portable gamma analyzer. The sampling and analysis processes were discussed as well as results of the comparison.

Results of Under Building Contamination Characterization using Horizontal Directional Drilling

Annette Primrose, Kaiser Hill/Rocky Flats Environmental Technology Site

Horizontal directional drilling was recently performed at Rocky Flats beneath two buildings suspected of contamination. This horizontal drilling technique which uses an air hammer rig, practically eliminates waste generation and reduces worker exposure and spread of contamination. This drilling method was combined with an environmental measurement while drilling (EMWD) process developed at SNL. Geoprobe data were also collected and compared to the drilling method. This drilling method was particularly effective in minimizing hazardous waste and was awarded the 'pollution prevention' award.

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Phased and Sequential Sampling Approaches Using Visual Sample Plan

Brent Pulsipher, Pacific Northwest National Laboratory

The Visual Sampling Plan (VSP) is a process that allows for phased or sequential sampling of a site. As the first set of data is evaluated statistically, the second phase is planned and so forth. This frequently results in fewer overall samples and meets the Data Quality Objective (DQO) requirements of obtaining the appropriate quantity and quality of samples needed to support confident decisions.

From Drill Hole Data to 3-D Geologic Models

David Vaniman, Los Alamos National Laboratory

At complex sites, a realistic geologic model requires an iterative process of providing input to the 3-D computational model from stratigraphic surfaces and petrographic, mineralogic, geochemical, and structural interpretations. This iterative approach developed at Los Alamos National Laboratory has provided an increasingly sophisticated model that captures detailed subsurface sediment and geologic structures. The hydrologic data and contaminant distributions are necessary inputs to the development of the model.

Session X - The Expanding Role of Geographic Information Systems

A revolution in software and hardware developments over the past decade has resulted in very powerful geographic information systems (GIS) applications capable of performing complex spatial analysis operations on typical desktop computers. This revolution has enabled environmental and other non-GIS professionals to make very effective use of this technology to support the spatial analysis needs of their work. The GIS panel session, chaired by Denise Bleakly of Sandia National Laboratories, was organized to highlight the important contributions made by GIS professionals and technology to environmental programs across the DOE complex.

Issues for Consideration for Long-term Spatial Data Archiving

Denise Bleakly, Sandia National Laboratories

This presentation focused on an extensive study to investigate long-term archival of a GIS database. Several federal agencies that handle large quantities of digital spatial data were surveyed to determine current data archival practices. These agencies in general use the Federal Geographic Data Committee (FGDC) metadata standard for information distribution and data indexing and the Spatial Data Transfer Standard (SDTS) for data distribution. Wide disparities exist between federal agencies regarding resources dedicated to handling the complex issue of long-term archival. Some of the complexities include stability and availability of storage media, hardware and software technological obsolescence, data refreshing and migration, long term costs, and the daunting task of extracting "information" from the archived data at some future time. No single solution exists for long-term data archival, however, the SDTS and FGDC standards have provided a starting point for addressing this complex issue. Many more resources will be required over the near-term to adequately resolve this issue, otherwise, invaluable data that cannot be reproduced or replaced may be soon lost forever.

Putting Geographic Information Systems on the Critical Path

Dan Collette, MACTEC Environmental Restoration Services

Mr. Collette laid out a historical perspective of the evolution of the GIS program at Grand Junction. As a fledgling organization, the GIS group drifted between several corporate organizations prior to finding a more permanent home within the Environmental Data Services Department. The GIS program at MACTEC migrated through three distinct phases of growth characterized at first by an insecure budget and mission and ending with a strong program, secure budget, well known, and well recognized capabilities. This positive evolution involved in no small part embracing good data management practices to ensure GIS data integrity from data collection, analysis, and final distribution of official record copy data. The next stage of this evolutionary process was comprised of automating the production environment by developing base maps with all available data layers, providing automated software tools for accessing environmental data stored in relational databases, developing standard layouts and symbology, and developing automated tools for loading and tiling georeferenced imagery. Dan concluded with sound advice for building a strong GIS program of striving to be a key contributor to the team, adopting and executing sound data management practices, balancing production and development activities, and employing technology that has long-term applicability.

GIS for Environmental and Waste Management Activities at Argonne

James Kuiper, Argonne National Laboratory (ANL)

In 1995, ANL-E began development of a GIS that has now become a key resource for environmental and waste management activities. The ANL-E GIS program supports environmental characterization and monitoring, wetland mitigation, and cultural resource compliance activities from planning stages to completion. The GIS also is used by operational divisions for master planning, infrastructure siting, emergency response, and public outreach. The ANL-E GIS now includes a database that exists as a repository of diverse spatial information.

Technical activities include database development, spatial analysis and modeling, visualization, and cartography. Portions of the GIS are available on the ANL-E intranet by using both an internally developed JAVA applet and a commercial web GIS package. The success of the system so far is largely due to inter-organizational collaboration at a "grassroots" level rather than a formal mandate. The synergy of bringing together information from many sources and organizations has also been instrumental. Current and future expected activities include a long-term stewardship initiative, 3-D visualization of proposed actions, and broader implementation of a web GIS.

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Cataloging and Mapping Extreme Microorganisms in Yellowstone National Park: Internet-Based Interactive Microbial Database and Map Server

Randy D. Lee, Idaho National Engineering and Environmental Laboratory (INEEL)

Mr. Lee introduced his presentation with some very beautiful and scenic photographs of geysers, fumaroles, fountain paint pots, hot springs, and wildlife scenery from Yellowstone National Park. One of the most striking and beautiful aspects of many of the geothermal features are the brilliant colors. These colors are indicative of a rich microbiological diversity existing in these extreme thermal environments that are an important strategic resource in fundamental scientific research. The INEEL is one of several federal organizations involved in fundamental research to investigate the biodiversity, biogeochemical processes, and indicators of ecosystem health of the Yellowstone thermal features. This scientific study involved cataloging a myriad of bioorganizms located across the park.

Organizing all of the data collected and transforming the data into useful and accessible information turned out to be a very challenging part of this overall investigation. The research data was organized to provide both GIS access to the spatial data and tabular access to data such as microorganisms at a particular geographic location. The web-enabled GIS application provided interactive mapping of features such as topography, thermal features, hydrography, lakes and streams, and geochemical/biogeochemical data. In addition, data input and survey forms were automated so that researchers could input data directly into the database and perform direct queries of existing data. Future plans include linking maps to phylogenetic tree data, including in situ data logging capability, and incorporating remote sensing, satellite imagery, and spectral data.

Post-Wildfire Geospatial Information Management at Los Alamos National Laboratory

Paul Rich, Los Alamos National Laboratory (LANL)

An immense amount of data is being generated in the aftermath of the May 2000 Cerro Grande Fire that burned a major area surrounding LANL and the surrounding town of Los Alamos, NM. Spatially referenced data includes fire effects on soils, water, vegetation, structures, and property. The Cerro Grande Rehabilitation Project (CGRP) GIS has been developed as a central repository for fire-related geospatial data. These data are available to LANL and external users via a simple web interface. For security and access control, data are stored on servers in an internal laboratory computer net (data storage capacity 2.3 terabytes), and on an external, public access net. The intent is to provide a LANL resource for consolidating important fire-related data, to inform the public, to assist scientists and emergency managers in assessing long-term environmental effects, and to be prepared for future emergencies.

Improving Access to Hanford Geospatial Information

Steven Rush, Fluor Hanford Chief Information Office

Mr. Rush described the formation of the Hanford Site Spatial Data Council (SSDC) and the management of spatial information at Hanford. Hanford has been generating and managing spatial data for over 50 years to support several diverse functions. Unfortunately, the data has been managed by many different stewards who have worked for different contractors with no consistent guidance for data format, metadata, or data accuracy. The SDDC therefore was formed in 1989 to coordinate data activities, set standards for all aspects of data generation at Hanford, implement a data repository with a catalog, and assure availability of spatial data to all involved parties. The SDDC adopted a framework to improve data sharing and create a widely available source of basic geographic data. Under the direction of the SDDC, all prime Hanford contractors are utilizing the Spatial Metadata Management System (SMMS) along with GeoConnect to serve spatial data coverages and related metadata on the Hanford intranet. The oversight of the SSDC at Hanford has resulted in higher confidence in spatial data accuracy, increased data sharing, especially between contractors, and a reduction in overall costs

"Green" Biopolymer Coatings for Improved Decontamination of Metals from Surfaces

John W. Barton, Oak Ridge National Laboratory

"Green" biopolymers is a science project in progress at Oak Ridge National Laboratory. Biopolymers are nonliving polysaccharide-based macro-molecules, which are generated by microorganisms; they are nonhazardous, degradable, and incinerable natural polymers. These biopolymers increase the viscosity of aqueous solutions, allowing them to coat metal surfaces and interact with the surface.

Aqueous biopolymer solutions were used to coat contaminated steel surfaces, allowed to interact with the metal surface over a prolonged period of time, then removed. Stainless steel coupons with fixed contamination were used to validate the performance of the biopolymer. Preliminary results showed the biopolymer system removed 80% of the uranium from the contaminated coupons. The interaction-binding process is quite slow taking hours even up to a day to complete the process. It may be possible to improve the efficiency of current day strippable coatings by incorporating this biopolymer component into the strippable coating matrix. The biopolymer solution solubilizes the heavy metals (uranium) from the surface, binds it into the biopolymer and when added to a strippable coating would allow you to remove the contamination by peeling away the biopolymer-radionuclide-coating layer.

Improved D&D Technologies for DOE's Deactivation and Decommissioning Projects

Robert C. Bedick, National Energy Technology Laboratory

Mr. Bedick presented an overview of the "Large Scale Demonstration and Deployment Project" (LSDDP) Program. The mission is to provide technological solutions that reduce the cost, risk and schedule to deactivate and decommission DOE's radiologically contaminated excess facilities. The approach is to demonstrate technologies in ongoing D&D projects in a side-by-side comparison with the baseline technologies and at a scale that will be convincing to end-users.

There have been seven projects funded to date, including projects at Argonne National Laboratory, Hanford, Fernald, Savannah River Site, Los Alamos National Laboratory, Mound and the Idaho National Engineering and Environmental Laboratory. Technologies have been demonstrated and deployed that make improvements in characterization, decontamination, dismantlement, material dispositioning and worker health and safety. These projects have resulted in over 100 new or innovative technologies deployed over 370 times at 10 DOE field offices since 1995.

These projects have validated the cost benefits of improved technologies and identified over 20 % cost savings when compared to the baseline. Using these new technologies should reduce the $39-billion Environmental Management D&D mortgage by 25-40%.

There are significant safety and economic benefits to be achieved through the use of safer more efficient D&D technologies.

A list of these technologies and associated documentation is available at http://www.fetc.doe.gov/dd .

Impact of Improved Technologies Deployed on D&D Projects at Hanford

Kim Koegler, Bechtel Hanford Inc.

The Hanford Environmental Restoration Project partnered with the Deactivation and Decommissioning Focus Area on three different projects to decommission excess facilities at the Hanford Site. The three projects included the C Reactor Interim Safe Storage Large-Scale Demonstration and Deployment Project, the Canyon Disposition Initiative Project, and the F Reactor Fuel Storage Basin Cleanout Accelerated Site Technology Deployment Project. There have been more than 36 deployments of improved technologies since 1996 resulting in minimized exposures and reduced health risk to workers. These new technologies also resulted in more than $31 million in projected savings and significant schedule improvement over the baseline.

Technologies used in the D&D activities in the C Reactor Interim Safe Storage LSDDP included the Mobile Integrated Temporary Utility System (MITUS), Laser-Assisted Ranging and Data System (LARADS) and the oxy-gas torch. This project resulted in 20 technology demonstrations and 13 deployments at C- Reactor and 18 additional deployments at other Hanford sites.

Technologies demonstrated in the Canyon Disposition Initiative (CDI) included Remote Characterization Platforms I & II, Non-Intrusive Liquid Level Detection and Ultrasonic Liquid Level Detection, 3D Visual and Gamma Ray Imaging System, Drain Line Characterization Robot, and Remote Concrete Coring System. A total of 13 technologies were deployed during the CDI activities contributing to a potential $500 million cost savings.

Five technologies were deployed at the F Reactor Fuel Storage Basin Cleanout Project including a Remote Retrieval System Compact Remote Console resulting in an estimated $2 million savings and a 2-year acceleration in the schedule.

Additional information is available at http://www.bhi-erc.com.

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The Mound Tritium Large Scale Demonstration and Deployment Project (LSDDP) Tritium D&D Project- A Final Report

Donald R. Krause, BWXT

The Mound Plant in Miamisburg OH was the first permanent Atomic Energy Commission (AEC) facility constructed after WWII as part of DOEs' weapons complex. They have 40+ years of weapons components production experience working with tritium. The site is currently undergoing Deactivation and Decommissioning (D&D) for final closure and will ultimately be turned over to the city of Miamisburg for commercial reuse. The T building is a massive underground concrete structure with 15-foot thick roof, 17-foot thick walls and 8-foot thick floor. T building was originally used to purify Po-210 and is filled with hundreds of gloveboxes and fumehoods, miles of piping and tubing, and other large pieces of tritium contaminated equipment. T building is slated to be cleaned up and reused.

The DDFA awarded Mound a Large Scale Demonstration and Deployment Project to demonstrate and integrate improved/ innovative technologies into the D&D activities in these facilities. An integrating contractor (IC) Team evaluated over 800 technologies and selected 40 for demonstration. Of the 40 approved 18 were demonstrated. These 18 included NOCHAR Petrobond oil solidification polymer, Burndy Hydraulic Crimper, LLNL Tritium Clean-up Cart, Fiber-optic scintillation tritium detector for high activity liquids, Rad Elec (REPERM) passive tritium air & surface monitor, SAMMS heavy metals removal liquids, Enthrall Heavy Metals Removal Material, TMS-2000 direct reading surface tritium proportional counter system, TechXtract for metals, TechXtract for concrete, Barter Process for Recycling Equipment into the Commercial Sector, WIC for solidifying high activity tritium, Scintillation Vial Disposal System, Concrete Tritium Characterization, Waterworks Crystals Superabsorbent Polymer, Lumi-Scint Liquid Scintillation Counter, PTS-27 Gas Ionization Tritium Detector, and Overhoff Flat Ferret Ionization Tritium Detector.

These technologies received good acceptance with a high percentage of deployments. There were a lot of lessons learned and using these innovative technologies will save DOE significant resources given wise management.

Heat Stress while Wearing PPE: Detection and Prevention

Aaron A. Ondo, National Hazmat Program

Heat stress has been one of the greatest and most overlooked threats to worker health and safety during cleanup operation in hazardous environments. This threat is compounded when workers are required to wear personnel protective equipment (PPE). Heat stress is the heat load to which a worker may be exposed from the combined contributions of metabolic cost of work, environmental factors and clothing requirements. Heat stress can be monitored in three ways; blood pressure, body temperature and heart rate.

Baseline technologies for measuring or managing heat stress are uncomfortable, restrict movement, inaccurate, unreliable, or not very portable. Several innovative heat stress technologies have been developed to measure or manage heat stress encountered by workers. Some of these technologies have been evaluated by the International Union of Operating Engineers National Hazmat Program.

Body clothing with cooling devices, incorporated into the clothing design to manage heat stress, was evaluated with mixed results. Of the products tested, the CORETECH Cool Suit proved to be most effective but did experience some failures and since core body temperature and heart rated are independent this alone does not solve the whole problem.

Heat stress measurement technologies were also evaluated with mixed results. Many were unreliable. The most reliable and most accurate was the CorTempä Pill. A battery operated pill that is swallowed and provides readout to handheld monitors. It is recommended that this be used in conjunction with a heart rate monitor. The next best alternative is the industry standard work/rest ratio guide. There is work underway to improve the current inner ear sensor technology and that progress should be monitored.

In-Situ Object Counting System (ISOCS) Deployment at the Nevada Test Site

Jeffrey L. Smith, Bechtel Nevada

A need was identified at the Nevada Test Site (NTS) to find an efficient and cost-effective tool to assist in the investigation and radiological characterization of several environmental restoration and D&D sites. The tool needed to provide near real-time data, needed to have the ability to quantify low-level waste generated on-site and provide in-situ quantitative values of surface soil measurements, and needed to reduce cost and survey time. This type of system would allow personnel to make decisions in the field without experiencing the delays associated with waiting for sample analysis or other baseline activities.

The Deactivation and Decommissioning Focus Area (DDFA) funded an Accelerated Site Technology Deployment Project to deal with this problem and the NTS chose the ISOCS to satisfy this need. It was portable, battery operated, had sufficient resolution, and was available commercially. The ISOCS consists of high-purity Germanium detector and a multi-channel analyzer connected to a laptop computer with specialized software developed by Canberra. The ISOCS met all their requirements and made it possible to release items from radiologically controlled areas that would have otherwise been classified as low-level waste. It accelerated the remediation of contaminated soil by three weeks and replaced baseline ex-situ

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sampling in MARSSIM surveys. Using the ISOCS at NTS has reduced waste characterization and verification sampling costs while shortening the baseline project schedule.

Remote Size Reduction (RSR) at the Savannah River Site (SRS)

David M. Yannitell, Westinghouse Savannah River Company

The Savannah River Site has identified a need for size reduction capabilities to dispose of a large and growing quantity of large contaminated equipment, to provide an improved sort capability and to size reduce newly generated waste. A Remote Operated Size Reduction System (ROSRS) was designed and constructed at Rocky Flats at a cost of over $9.5M to remotely size reduce a variety of plutonium-contaminated gloveboxes. The operating contractor at Rocky Flats Environmental Technology Site (RFETS) restructured and chose a different method of disassembling the gloveboxes and no longer intends to deploy the unit. Since it is fully paid for, and DOE owns it, SRS has decided to deploy the system at their Decontamination Facility.

ROSRS is a self-contained, remotely operated size reduction system intended to increase worker safety, minimize exposure to personnel, improve productivity and accelerate cleanup schedules all while reducing cost.

SRS plans to use the ROSRS to size reduce a backlog of 120,000 ft^3 of contaminated equipment and reduce the disposal volume by of 70,000 ft^3 saving approximately $30 million. It is estimated to cost an additional $2 million before the system is setup and operating at SRS. They plan to have ROSRS up an operational in September 2002.

Session XII - Decision Time: DOE Land Use-Tools and Process (CRESP)

A common need among DOE sites is to be able to determine the processes and information required to arrive at protective and acceptable land use decisions. Presentations in this session described some practical tools and processes resulting from research done by the Consortium for Risk Evaluation with Stakeholder Participation II (CRESP II) and used to aid land use decision processed at one or more DOE sites. CRESP II is a consortium of universities with nationally known researchers from diverse disciplines working to facilitate risk-driven end-point focused decisions in the DOE complex. More information about CRESP II can be found at http://www.cresp.org.

Obstacles and Resolutions for Decisions on Site Land Use

Charles Powers, Rutgers University

Mr. Powers provided context for how the presentations in this session related to two themes: 1) how to overcome the mix of regulatory, social, economic and technical obstacles to decisions faced by DOE managers as they develop end-state remediation targets in clean-up and 2) the need to develop both a method for guiding a top to bottom risk-based review of site activities and better ways to identify and achieve more integrated regulatory approaches to guide DOE compliance. Determining the end-state remediation targets is tied to expected land use, yet the appropriate land use cannot be identified until adequate characterization of the waste site occurs. This is the fundamental dilemma of closure and completion. Subsequent presentations in this session describe practices and models for selecting appropriate land use with initial focus on the characterization process, and then on the land use decision-making process.

For more information, contact Charles Powers, at 732-296-1960 or cwpowers@eohsi.rutgers.edu.

The Integrator Operable Unit - Its place in Land Use

David Kossom, Vanderbilt University
Charles Powers, Rutgers University

Regulatory regimes typically focus on defining and implementing interim stabilizing action in areas immediately surrounding known sources of contamination or operable units. This approach defines remedial needs based upon independent evaluation of each known or suspected contaminated area and results in dividing a site into a potentially infinite number of clean-up sites. This approach results in a perspective that cannot clearly characterize the contaminant source or its pathways to receptors holistically. Lack of regulator confidence in identifying all the possible operable units and site managers' fear of creating an infinite number of operable units are the resulting problems. Most important, defining and implementing operable units in this way limits the ability to link remediation activity with land use decisions.

The Integrator Operable Unit (IOU) is a new paradigm developed at the Savannah River Site that treats site geography and hazard receptor identification more realistically and comprehensively than with the current approach. The IOU program does not replace operable units but creates a structure to provide a comprehensive perspective to facilitate appropriate endpoint decisions consistent with risk characterization and future use at large DOE sites. The IOU creates a multi-media focus for large land areas that includes soils, ground water, sediments, surface water, flora and fauna and provides the basis of how to envision the steps needed to create an integrated environmental management system, and then address with finality sites' environmental problems.

For more information contact David Kosson at the Department of Civil and Environmental Engineering, Vanderbilt University at 615-322-1064 or David.kosson@vanderbilt.edu. Charles Powers at 732-296-1960 or cwpowers@eoshi.rutgers.edu.

Assessment Tools for Ecological Services and Future Land Use

Joanna Burger, Rutgers University

Ms. Burger provided an overview of many ecological factors to be considered in long-term stewardship of DOE sites. Decisions about cleanup, remediation, and long-term stewardship on DOE lands depend partly upon understanding ecological health and the relative importance of site-specific resources. Long term stewardship should protect both human and ecological health, maintain biologic diversity and ecological integrity, and integrate human and ecological values. When identifying hazards that need to be controlled, ecological receptors at the ecosystem, community, population and individual levels need to be evaluated. Stewardship must be considered both before, during, and after both remediation and restoration. And remediation that harms the environment and hinders appropriate land use should particularly be avoided. Dr. Burger described a series of studies that use different receptors such

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as fish, raccoon, and morning dove to examine risk at DOE sites to both human and ecological receptors. These studies provide examples of ways to integrate the assessment of ecological risk with human risk in characterizing site conditions.

For more information contact Joanna Burger at Rutgers University 732 445-4318 or burger@biology.rutgers.edu.

Infrastructure and Stewardship: An Essential Pairing

Henry Mayer, Rutgers University

Mr. Mayer discussed the need for infrastructure and stewardship to be considered as intertwined issues as decisions about site cleanup or new missions at DOE sites are made. Exploration of both stewardship and infrastructure requirements suggest that mission, stewardship, infrastructure and land use planning should be approached on an integrated, cross-functional and site-wide basis. Stewardship requires infrastructure: cleanup efforts will continue at the largest sites for another 20-40 years - equivalent to the expected useful life of new infrastructure; demolition and long-term stewardship activities initiated at other site areas will share roads, safety systems, and utilities with missions; long-term stewardship responsibility for pump and treat, containment, monitoring and security will require on-site staff and critical infrastructure.

Barriers and issues exist that make integrated planning difficult Critical Defense missions, EM programs, and other ongoing missions are often funded separately from, and are given higher priority than site infrastructure. Long-term stewardship is often viewed as starting after cleanup is completed. In most instances, possible infrastructure needs are not considered during cleanup. Specific suggestions for changing to a more integrated approach start with the question," Is there a more efficient and less costly way of getting from here to there?"

For more information contact Hank Mayers at (732) 932-0387 or hmayers@rci.rutgers.edu.

Listening to Community Leaders about Land Use

Lynn M. Waishwell, Consortium for Risk Evaluation with Stakeholder Participation

Ms. Waishwell presented a summary of interviews conducted by Karen Lowrie, CRESP researcher, with community leaders from regions around three different DOE sites that face different futures, ranging from complete closure to ongoing continuing missions. Thirty-eight community leaders from Paducah, Portsmouth and Rocky Flats were interviewed about their perceptions about impacts of the DOE site on the region, their understanding of stewardship, and preferences for future land use and suggestions for public involvement. Key findings about stewardship were that local planners were uncertain about the nature of stewardship because of the uncertainty about expected ends. Interviewees reported that the DOE sites are important to local economies, but that they bring "both burdens and benefits," and that stewardship efforts should address both regional environmental and economic dimensions. With regard to future land use, interviewees said that some regional consensus about land use has been achieved, but there is a need for continued dialogue. Public participation needs improvement, and is considered a valuable way to hold DOE accountable.

For more information contact Karen Lowrie at Rutgers University (732) 932-0387, x577 or klowrie@rci.rutgers.edu.

Promoting Long-term Decision Transparency with Geographic and WWW Information Technology

Christina H. Drew, University of Washington (UW)

Ms. Drew presented a demonstration project using geographic and internet technologies to describe DOE Hanford site cleanup decision information in a way that allows stakeholders to provide feedback. The purpose of the Decision Mapping System (DMS) is to allow for better understanding of cleanup by stakeholders. Many benefits result including: better public involvement leading to more lasting and creative solutions, potentially greater cost effectiveness, the prevention of institutional memory loss by having all documents and records in one easily accessible place using Area 100 as the pro-type, and a website that collects and integrates all documents that related to cleanup decisions into one easy-to-understand format. The DMS can be used to learn about Hanford cleanup in the 100 Area, use maps to see where cleanup is being done, and relate specific documents and decisions to specific sites, and to see what has yet to be completed. Benefits of this DMS are: integration of multiple sources of detailed waste site information into a single source; recording of spatial, temporal and social dimensions of cleanup decisions, and serving as a lasting institutional control.

For more information contact Christi Drew, Department of Geography, UW, at 206-616-7413 or cdrew@u.washington.edu.

The Mound Long-term Stewardship Initiative

Donald R. Krause, BWXT Services, Inc.

The Mound Long-term Stewardship Initiative (LTSI) mission is to assess and demonstrate technologies for monitoring of Mound after the site is cleaned up. Mound was used as part of the Manhattan Project and has a history of over 40 years of working with tritium, other radionuclides, and hazardous materials. Mound has been sold to the City of Miamisburg for use as an industrial park. The site will be cleaned to industrial standards and operated on a stringent operation and management plan. Don provided an interesting summary of some of the more problematic cleanup areas at Mound. The Mound LTSI will systematically explore and identify improved technologies to validate the effectiveness of institutional controls on the site. The focus of the technologies will be for monitoring buildings and above ground areas, but will also be for evaluating and monitoring soil, water and other environmental media. Selected technologies will be cost effective and efficient. They will be deployed prior to site closure in 2006. Monitoring of soil movement will be one major technology that will be evaluated because of a deed restriction of removal of soil from the site. A report will be issued that provides the technologies that were evaluated and what the demonstration of the technologies produced.

Decisional Process for Developing Stewardship Plans

Elizabeth Hocking, Argonne National Laboratory

Elizabeth began by defining stewardship as what it takes to keep a site safe at the lowest risk and lowest cost while still satisfying legal obligations, limiting future liability and fulfilling your ethical imperative. In order to be effective, stewardship systems must have several components: containment system, land use controls, monitoring system, information management system, and an organization system. Stewardship is an interactive system that must act when events occur, can measure performance, and adjust to optimize its behavior over time. There must be consensus from the responsible party, the regulators, and the public on the stewardship system in place. Working with groups comprised of the interested parties at Mound proved to be very helpful at defining the objectives of the stewardship system. It was extremely helpful to go through the process with these parties because it revealed some fundamental concerns about the LTS effectiveness and produced potential solutions for these concerns. For example, one of the chief concerns was over the loss of records for the site, seen as having a high probability with a high risk for failure of record keeping. From identification of such concerns, mitigation strategies can be implemented to address such concerns. By playing out a failure scenario, such as what if soil is removed from the site, you can go through the process to determine what mitigation strategies can be deployed to prevent such occurrences. These mitigation strategies must be integrated with the other stewardship components to be effective. In conclusion, the key to a successful stewardship process is gathering the right people from the community, government agencies, and professional.

Information Management System Design for Stewardship: An Argonne Prototype

Robert Johnson, Argonne National Laboratory

An LTS information management (IM) serves several functions, including archiving pertinent information, educating current and future stakeholders, identifying potential issues before they become a crisis and assisting in addressing future problems if and when they arise. It is believed that IM failures may pose the largest liability to DOE. So far LTS cost analyses have focused on predictable costs such as monitoring. There are much larger potential costs from unknown outcomes such as unplanned interventions. There may be a need to revisit closed sites because of lack of stakeholder confidence as a result of lack of historical information. One example is a 19-acre site at Argonne National Laboratory (ANL) where there were nuclear facilities. In 1955 the site was remediated, closed, and turned over to Cook County Forest Preserve District. In 1976 the site was re-characterized because of discoveries of tritium in groundwater. In 1990 the site was again re-characterized and there was limited soil removal in response to uranium discovery. Was it really a health concern or lack of information that necessitated the reinvestigation? Reorganizations are one way that information is lost within the DOE system and often there is no communication between overlapping organizations. How do you operate an information management system at a location such as ANL, where responsibilities are often split between several organizational units? These programs currently maintain information on separate and incompatible systems. Lots of information also exists only in hard copy format. ANL is currently working towards developing an integrated IM plan. Information management is an important piece of any LTS plan and implementation. Thought must be put into the audiences that are utilizing the IM, what information needs to be stored, and how the information should and can be provided. ANL LTS has developed an IM prototype with an emphasis on

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metadata and monitoring well information. It began by addressing the immediate needs of ANL technical staff involved with site-wide monitoring. The logic was developed that will integrate information across the sites, permits and information types. It will complement, not replace, systems already in use. Its important that an LTS IM is designed to allow growth as new technologies in information management become available. ANL has the approach that metadata development is a key target that can be used to develop standards for the compilation and sharing of information. Some of the means of the dynamic sharing information include ArcIMS for visual access, ColdFusion, and Pop Charts (Web server service). Challenges to full implementation of IM for LTS are funding issues, data integration, information recovery issues, and institutional ownership.

LTS Decision Process Simulation: Insights Gained

Julie Marble, Idaho National Engineering & Environmental Laboratory

Julie presented the results of an LTS Decision Process Simulation that was conducted at the Department of Energy (DOE)/ Grand Junction Long-term Stewardship Workshop representing stakeholders, state regulators, and DOE. Why simulate long-term stewardship? To establish a good decision framework that is inclusive, open and understandable, and allows for broad framing. A good decision framework is also robust and adaptive to change. The purposes of the simulation was to identify the activities that meet player expectations, identify the type of LTS decisions, provide critical information for LTS decisions, and allow players to interact in decision neutral settings. A fictional illustration was provided that had models ranging from arid to humid environments. The conference was split into groups and scribes were assigned to record the activities of the groups. The prototype sites were based on characteristics of actual sites but did not emulate any particular site. Simulating a prototype sites was performed because it emphasized that the sites in LTS face similar challenges and a prototype site would involve participants equally, without creating the more personal and individual issues that occur with a real site. The information needs, decisions, and emergent issues between and among the participants were collected and analyzed during the simulation. Some of the common issues that came from the groups regardless of environmental setting were defining the purpose and audience of an LTS plan. The groups agreed that it needed to be inclusive of all parties involved. The level of stakeholder involvement was an issue among all the groups with concern expressed over identifying who would make decisions regarding the stewardship issues at the site. They also all agreed that information management was a critical component to LTS success and suggested establishing a national registry of contaminated DOE sites. Funding continuity and enforceability was a big issue among the groups for their sites. One solution could be that the LTS needs to be tied to the Record of Decision (ROD) on the site. Technology issues and risk issues were not emphasized in the groups. In conclusion, the LTS simulation worked well in broaching a wide variety of concerns and was a good tool in bringing about active participation among stakeholders.

The Use of Geospatial Information in Long-term Stewardship

John C. Stewart, U.S. Department of Energy-Headquarters

Information needed for LTS exists in many digital and non-digital forms, including memoranda, reports, and other documents. Tools to manage these data include document management, data warehousing, web-based content management, geographic information systems (GIS), and computer aided designs (CAD). GIS is one of the tools that are important for LTS because decision makers must have accurate, reliable and timely information to ensure continued protection of human health and the environment. The information is spatial in nature, which allows the presentation of many levels of data. John discussed what components of GIS entailed including geospatial referencing. GIS data can be used interactively with simple and free GIS software. ArcExplorer uses the same data format as the sophisticated GIS software. Most of the laboratories and DOE offices use GIS for characterization of their sites. Some of the laboratories have linked their GIS information to Web based pages. Since the September 11 attack and heightened security, some of these web pages have had to be pulled. However, GIS and web-based data information systems remain an important LTS tool. John presented a survey response on GIS/CAD at DOE field sites and what plans there were to upgrade in 2001. The benefits of spatial referenced data to DOE are to allow DOE to do a better job in reporting, planning, costs, and accountability.

Remediation of a Former PCB Transformer Site at Los Alamos National Laboratory

Gabriela M. Lopez-Escobedo, Los Alamos National Laboratory

Ms. Lopez-Escobedo presented a review of the remediation of a former PCB transformer site and the regulatory and stakeholder issues involved. The site --with initial levels of PCBs up to 10,000 parts per million -- was the first cleanup at a DOE facility in U.S. EPA Region 6 where the goal of less than one part per million for PCBs was implemented.

The site presented many challenges including the fact that perchloroethylene (PCE) and mercury were present as well as PCBs, making it both a Resource Conservation and Recovery Act (RCRA) and a Toxic Substance Control Act (TSCA) site and involving multiple regulators. The site's location in a watercourse also played a role. By working closely with regulators, the project was able to:

- Provide a risk-based disposal application that led to disposal of PCB remediation wastes with less than 50 parts per million in an industrial landfill. This saved the project an estimated $525,000 in disposal fees and transportation costs.
- Achieve an agreement on cleanup level requiring that only unconsolidated materials needed to be excavated at the site and not bedrock.
- Obtain a dredge and fill permit from state regulators in three weeks to keep the project on schedule.
- Work with state "oversight bureau" staff to monitor the stream during the dredge and fill operation.
- Coordinate a sampling strategy for all contaminants.
- Coordinate continuing funding despite a doubling of excavation scope.
- Reduce restoration scope to focus on critical mesa area and complete work prior to "monsoon" season.

Escobedo also discussed a problem of dealing with uncharacteristic data for arsenic and how EPA regulators cooperated to resample and analyze the data.

In summary, the regulator interface helped improve the speed of decision making, kept the project on track by solving problems as they occurred and saved time and money. The author expects the site to be removed from the Los Alamos permit thanks in part to the positive regulator interface in resolving key issues.

Overcoming the Humpty Dumpty Syndrome in Radioactive Waste Management

Peter Siebach, U.S. Department of Energy, Chicago Operations Center for Risk Excellence

Mr. Siebach went to Clark County, Nevada, to understand meaningful ways to communicate with local governments and residents about DOE operations at Yucca Mountain. He was lectured by local government leaders and spurned by his aunt. He learned the lesson of the "Humpty Dumpty Syndrome" in Radioactive Waste Management. Essentially, Siebach told his audience, who controls the words, controls the argument.

Siebach cited use of some word pairings and how they provide a different understanding of issues to those discussing them. These included:

- Probability or certainty
- Dump or disposal facility
- Accident compared to mobile Chernobyl
- Clean or contaminated

The words "nuclear" or "radiation" invoke negative and often malevolent images in the minds of the public. But to scientists and engineers, the same words are often accompanied by beneficial images. This perception gulf has been called the Humpty Dumpty Syndrome. Seibach reviewed some web-based tools, developed at the Center for Risk Excellence to avoid these misunderstandings based on a common framework of terminology. He presented a matrix of Focus Area needs and Center tools. One of these was a guide for risk training in assessment, management and communication. Also discussed was an innovative database on compliance agreement criteria to help in negotiations with regulators. Center personnel will be meeting with focus area representatives to explain these products in the near future, he reported.

Savannah River Site (SRS) Fish Consumption Advisory Communication: Science and Community Partnership

Lynn M. Waishwell, Consortium for Risk Evaluation with Stakeholder Participation

Ms. Waishwell presented findings of a fish consumption advisory project on behalf of co-authors Brendolyn Jenkins and Joanna Burger. The DOE-funded, independent research organization, CRESP II, addresses a variety of risk related issues. Determining the best way to communicate the risks from eating contaminated fish was found to be a complicated and often-inconsistent process during the research, she reported.

The discovery that chemicals (particularly mercury)

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from upstream commercial plants and radioactivity (cesium and strontium) from the DOE's Savannah River Site might pose adverse health effects, led to a risk management response by agencies in both Georgia and South Carolina. While fish advisories have been on the rise in many areas of the U.S. in recent years, the advisories are difficult to understand for some populations, CRESP researchers found.

Waishwell's presentation tracked the development of a fact sheet, including audience identification, preliminary discussions with a variety of stakeholders and actual pilot testing and issuance of the sheets. The researchers found the dissemination of fish fact sheets along the river was effective. They found that major messages were understood by the target audiences. Sample sheets were reviewed by the author. A future direction for research will be to determine effectiveness of the fish fact sheets in altering behavior of the target audiences.

The Transportation Resource Exchange Center (T-REX): A Case Study

Mary White, Transportation Resource Exchange Center

Ms. White discussed T-REX -- a case study of the Transportation Resource Exchange Center. This is a unique virtual library that provides information about the transport of radioactive materials to a variety of stakeholders online. The site address: http://www.trex-center.org/.

Developers of the center began with a user needs assessment survey of internal and external stakeholders. Funding and information also came from the DOE's National Transportation Program. The survey identified gaps between user questions and information available. Two key areas of interest for stakeholders were environmental issues and current news, both addressed in the library. Also a part of the library is a compilation of all public comments and responses on transportation issues from DOE environmental impact statements. This searchable database shows comment trends and led the production of a set of frequently asked questions.

T-REX ensures that users have the information needed for a variety of organizations, White explained. Audiences identified include special interest groups, state, tribal and logal government, the general public, radioactive materials carriers and others including the news media and academia. DOE audiences include the , department traffic managers, national laboratories and other contractors to the energy department. The library encourages individuals who produce information to contribute to the archives, making information producers and users one in the same. Reference and research services are also available through the T-REX virtual library -- a product of the unique university support available to the program.

Session XV - Cerro Grande Fire: Evaluating Effects and Erosion Mitigation Effectiveness

A prescribed fire set at Bandelier National Monument on May 4, 2000 quickly grew into New Mexico's largest-ever wildfire, burning more than 47,000 acres and prompting the evacuation of an estimated 20,000 people. The fires burned nearly 80 square miles of northern New Mexico and more than 400 houses and apartments. The short- and long-term impacts of the Cerro Grande Fire are being aggressively investigated by personnel from the Los Alamos National Laboratory and the New Mexico Environment Department.

The Cerro Grande Fire significantly impacted several major watersheds near and within Los Alamos National Laboratory. Portions of the upper Pajarito Canyon watershed were severely burned. Following the fire, traceable chemical changes in stream waters were tested to determine the hydraulic connectivity between surface waters and down-gradient spring waters. Both stream and spring waters were collected within one month of the fire and into the fall of 2000. Results show that some chemical species, notably bicarbonate, had apparently passed through a fault zone to down-gradient springs in less than 30 days. Results indicate that post-fire surface water may be chemically traced to deep saturated zones and improve the hydrogeologic conceptual model for the Los Alamos area.

The Canada del Buey watershed was a high intensity burn area. The fire affected 21 potential release sites that were in need of erosion control measures. Erosion control measures, such as rock gabions, log-silt barriers and straw waffles, as well as raking, mulching, reseeding, and hydro-mulching, were employed to determine the effectiveness of erosion controls installed within the watershed.

Ash is a major suspended constituent present in watershed surface water. Ash and charcoal produced from the fire contain Ba, Ca, CO^3, Fe, Mg, Mn, K, Na, SiO^2, Sr, U and other trace elements. Calcite has formed within the ash as well as elevated concentrations of Mn, Sr, and U in surface and alluvial ground water. Increased concentrations of HCO^3 provide ligands for complexing with dissolved U(VI) species.

The Cerro Grande Fire burned much of Los Alamos National Laboratory's Technical Area (TA) 16, a high explosive (HE) production site. Major contaminants at TA-16 include HE and metals, particularly barium. The Cerro Grande Fire affected Environmental Restoration (ER) activities two major ways: 1) providing an impetus to accelerate site clean-up in burned, flood-prone areas and 2) modifying ongoing corrective measures studies. Data since September 2000 indicate minimal effects on contaminant abundances in streams and alluvial waters at TA-16; principal impacts appear to be on naturally-occurring constituents such as NA, Ca, and HCO^3, all which have increased in abundance since the Cerro Grande Fire.

Input for this session was provided by:

Barbara Hoditschek, U.S. Department of Energy Oversight Bureau

Michael Dale, New Mexico Environment Department DOE Oversight Bureau

Donald D. Hickmott, Los Alamos National Laboratory

Patrick Longmire, Los Alamos National Laboratory

Aerobic Bioremediation of Soil and Ground Water Contaminated with Trichloroethylene

Donald Perry, BioRemedial Technologies, Incorporated

Mr. Perry spoke of degrading trichloroethylene (TCE) in soil and ground water through the use of aerobic microbes. Aerobic degradation of TCE is not a naturally occurring process because in an aerobic environment, TCE is not normally used as a carbon or energy source. Therefore, degradation is accomplished through cometabolism.

A ground water recirculation/soil washing system has been designed to capitalize on an aerobic cometabolite, Compound CTM. Contaminant degrading microorganisms were identified based on their ability to express an oxygenase enzyme system. Initial microbial concentrations of each well were determined prior to site treatment.

Ground water is extracted from the source area and added to an on-site bioreactor. Inorganic nutrients and Compound CTM are added to increase biomass and stimulate TCE degradation. The bioreactor culture is introduced into strategically placed points surrounding the extraction well. Through use of this technology, TCE concentrations have been shown to be greatly reduced in both soil and ground water in the first nine months of operation.

Successful PCE Remediation using In-Situ Chemical Oxidation - Lessons learned

Christopher Nelson, In-Situ Oxidative Technologies, Inc.

Mr. Nelson discussed the use of in situ oxidation at a major industrial complex in South Central Colorado. In situ oxidation was evaluated as a remedial option to address the concerns of diminishing tetrachloroethane (PCE) recovery from existing vapor extraction and pump and treat systems. After successful laboratory and field pilot tests using a modified Fenton's reagent, full scale remediation was initiated. To date, two injection events have occurred utilizing 30 injection wells during each event. Approximately four gallons of separate-phase PCE have been recovered due to the induced desorption of PCE via the injection of chemical oxidation reagents. This is equivalent to 800 million gallons of ground water at 5 ppb or 2.4 year of ground water pumping and treatment using existing systems at the site. An additional eight gallons of separate-phase PCE has been oxidized based on dissolved phase PCE reductions within the treatment area. Twenty-eight additional gallons of phase-separated PCE have been oxidized based on conservative mass balance estimates.

The Bioaccumulation and Uptake of Thorium in Native Grass Species and Tumbleweeds in a Semi-Arid Environment

Yvonne McClellan, Sandia National Laboratories

Ms. McClellan presented data from a study of concentrations of thorium-232 in both native grass species and tumbleweeds 20 years after the original deposition of thorium into the soil at Site 5 at Kirkland AFB, New Mexico. Samples of vegetation were collected annually in the fall of 1997-2000 and analyzed for Thorium-232 and daughter products. This study examined thorium uptake and bioaccumulation in native grass species and tumbleweeds and evaluated the potential of using tumbleweeds as a bioremediation tool as well as a migration and exposure mechanism. Thorium-232 concentrations in tumbleweeds showed a substantial bioaccumulation increase of contaminant over grassland species. This is important because of the potential redeposition and migration of contaminant off-site.

Use of HRC™ to Remediate Ground Water at Low Flow, Low Permeability Sites

Annette Primrose, Kaiser Hill/Rocky Flats Environmental Technology Site

As a result of storage activities, a ground water plume of tetrachloroethane (PCE) and other volatile organic compounds (VOCs) developed at the PU&D Yard at the Rocky Flats Environmental Technology Site (RFETS). Annette Primrose presented the results of a treatability study that evaluated the effectiveness of the Hydrogen Release Compound™ (HRC™) in low-flow ground water regimes. HRC™ is a proprietary polylactate ester that slowly releases lactic acid which is a hydrogen source for microbial dechlorination.

After the introduction of HRC™, the concentrations of PCE and its byproducts increased probably due to the HRC™ acting as a surfactant. The subsequent decrease in PCE corresponded with the appearance of additional byproducts and an increase of 120% in the ratio of byproducts to PCE, probably as a result of dehalogenation.

Although the results are not yet conclusive and additional sampling is being conducted, it appears that water level fluctuations and other site factors might have had a negative influence on biodegradation with HRC™. However, there are indications that HRC™ has reduced the overall contaminant mass.

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Passive Reactive Barriers Operation at Rocky Flats Environmental Technology Site

Annette Primrose, Kaiser Hill/Rocky Flats Environmental Technology Site

Ms. Primrose provided information on three passive reactive barrier systems in operation at the Rocky Flats Environmental Technology Site (RFETS). The Mound Site Plume Treatment System uses reactive barrier technology to collect and treat contaminated ground water derived from the Mound Site area. The source area was removed as an accelerated action in 1997. Installation of the 220-foot long collection system and two treatment cells containing reactive iron was completed in 1998. The system is designed to meet the Ground water Action Level Framework Tier 2 concentrations defined in the Rocky Flats Cleanup Agreement. The Mound Site Plume System employs innovative technology to treat ground water contaminated with chlorinated volatile organic compounds (VOCs) and low levels of radionuclides. The effectiveness and feasibility of using this technology on other contaminated ground water plumes was demonstrated by this project. Analytical results continue to show that the treatment system is effectively removing both VOCs and radionuclides below the action levels.

The East Trenches Plume Treatment System collects and treats the contaminated ground water derived from the Trench 3 and Trench 4 area. The system consists of a collection trench with a layer of gravel-iron fillings mixture, a high density polyethylene barrier on the downgradient and a sand layer with perforated piping. All contaminants were reduced to below Action Levels with the exception of methylene chloride.

The Solar Ponds ground water plume contains low levels of nitrate and uranium generally attributed to storage and evaporation of radioactive and hazardous liquids wastes in the Solar Evaporation Pounds from 1953 to 1986. The Solar Ponds Plume Treatment System is different from the passive, flow-through systems installed for the Mound Plume and East Trenches Plumes. As originally designed, the treatment cell was to be located near North Walnut Creek. Water was expected to be intercepted and flow by gravity to the treatment cell without detention in the collection trench. Because the Preble's Meadow Jumping Mouse (a Federally Listed Threatened Species) is present at the optimal location of a flow-through treatment cell, the treatment cell was located immediately adjacent to the collection trench, not 400 feet downgradient as was originally planned. As a result, the collection trench for this system must hold approximately 11 feet of ground water to develop sufficient hydraulic head for the ground water to flow into the treatment cell. The cell consists of two treatment zones, one filled with organic material (sawdust and leaf mold) and 10% iron, and the second with iron fillings.

Remediation of Radioactive Contamination in Surface Soils at Department of Energy Sites

Ralph F. Smiecinski, U.S. Department of Energy, Nevada Operations Office

Mr. Smiecinski discussed the objectives and results of a workshop on the use of technologies to remediate radioactive surface soils, jointly hosted by the Nevada Operations Office and the Subsurface Contaminants Focus Area. The workshop was attended by technology vendors, representatives from the Office of Science and Technology (OST) and remediation managers from other DOE sites. The vendors provided information on technical capabilities, available technologies, specific applications, cost and performance results, and technology benefits. OST participants described ongoing research and development efforts, technical assistance programs, multi-site opportunities and an overall national perspective. Remediation managers from the DOE sites provided information on performance expectations, technical specifications, baseline technologies and costs, site conditions, schedule and regulatory drivers, and site contacts. As a result of the workshop, participants had a greater understanding of the: 1) extent of the radioactive soil remediation problem; 2) technologies and capabilities currently available and under development to meet the problem; 3) support available from OST to help solve the problem; and 4) the path forward to address the problem.

Reducing Transportation and Shipping Costs by Utilizing Reusable Containers and Rail Conveyance

Kenneth M. Grumski, MHF Logistical Solutions, Inc.

The West Valley Demonstration Project (WVDP) was challenged with shipping 30,000 cubic feet of LLW that was in hundreds of previously packaged soil boxes. These containers were not Department of Transportation (DOT) compliant. Repackaging the soil from the boxes would have been a costly and labor-intensive project. The alternative selected was using cargo containers to ship the waste to Envirocare of Utah by truck and rail. During the first phase the containers were shipped by truck to Pennsylvania, and then from Pennsylvania to Utah by rail. During the second phase, the WVDP rail system was upgraded and the shipments were made directly to Utah by rail.

A rack system was designed for a standard twenty foot top-loading container that could accommodate four soil boxes. This system allowed the soil boxes to be quickly and easily loaded into the container. The money saved by the truck-to-rail shipments was invested in upgrading the onsite rail facility to accommodate direct rail shipments. Truck-to-rail shipments were about 33% less expensive than truck only, and rail only shipments cost about 49% less than truck only shipments.

The larger containers reduced the material handling costs by increasing the shipment volume and eliminating the need to repackage, size reduce, or sort the waste. Additionally, because the material was handled less, worker exposure decreased. WVDP was able to meet its FY2000 milestone of shipping 30,000 cubic feet of low-level waste (LLW) off site.

Waste Elimination Team

Greg Hulet, TRU and Mixed Waste Focus Area

Mr. Hulet outlined the Waste Elimination Team and their on-going activities. The Waste Elimination Team provides technical assistance related to unique wastes. The team is currently working in the areas of elemental mercury, mercury soil and sludge, organic liquids, uranium chips, gas cylinders, lead acid batteries, classified configurations, tritium contaminated waste, and oversized transuranic (TRU) boxes. These waste streams present unique technology deployment problems because they are so small. Commercial sites will not deploy treatment technologies without guaranteed waste streams and DOE sites do not want to go through the permitting process for small quantities of waste. The Waste Elimination Team's strategy is developing combined campaigns at sites with similar wastes to expedite the deployment of technologies and subsequent treatment of waste.

Small quantities of mercury exist at several sites, but economies of scale will be accomplished by the on-going combined treatment campaign. The Allied Technology Group (ATG) at Hanford will treat the elemental mercury, and M&EC will treat the soil and sludge. Mercury amalgamation and stabilization processes were put in place this fall, and shipments will begin this winter. Several technologies are ready for deployment to treat reactives. Uranium chips were selected for a combined campaign because of their universality. The vendor has been selected, and the contract was expected to be put in place during November 2001. All sites will be able to access the contract. A contract for gas cylinder treatment was also expected during November 2001. The cylinders will be treated at a central facility. The Waste Elimination Team will finance an inventory of the cylinders on-site, and the sites will be responsible for shipments to the central facility.

Pollution Prevention, Waste Minimization and Material Recycling Successes Realized During Savannah River Site's K Area Materials Storage (KAMS) Project, W226

R. E. Koenig II, Westinghouse Savannah River Company

The KAMS project was a one-year project to prepare the 105-K reactor building for receiving and storing over 4,000 plutonium drums from Rocky Flats. The KAMS project team analyzed the project scope to identify alternatives to the traditional "throw it all away" approach.

The initial project planning investigated and incorporated Best Practices from DOE and Commercial experience. An effort was made to identify and locate an end use for all salvageable equipment. For example, a heavy water tank was relocated to the H area for use as a waste container. Two 54 tons shield doors were removed and decontaminated. Recycling this steel greatly reduced the volume of waste produced. The project included lowering a stack 21 meters. Extensive sampling found that very little of the concrete was contaminated and could therefore be disposed of as rubble.

The following savings were realized:

- Approximately 1,451 cubic feet of low level waste (LLW) generation with $153,806 treatment, storage, and disposal costs avoided

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- About 108 tons of steel worth roughly $47,000 were reused
- Sampling and characterization processes were able to divert 3,564 cubic feet of LLW from vault disposal to land fill rubble, saving about $417,384.
- 11,049 square feet of the 14,991 square foot radiological area was reclaimed as clean. The elimination of the radiological area resulted in $292,600 manpower efficiency improvements.

The extensive upfront planning and sampling allowed the KAMS project team to incorporate many waste minimization and pollution prevention strategies, which resulted in significant savings.

Equipment Reuse Process: Bartered Sale of DOE Mound Contaminated Equipment

Donald R. Krause, BWXT Services, Inc.

The Mound site in Miamisburg, OH was the first Atomic Energy Commission facility built after World War II. It produced nuclear and non-nuclear weapons components for over 40 years. The site includes extensive tritium facilities, and has been designated for shut down. The decommissioning scope includes over 1,000 linear feet of gloveboxes, miles of piping (stainless steel and copper), large pieces of equipment (tanks and ductwork), contaminated structural material, and tritiated oils, mercury and water.

The Mound site was used as a Large Scale Demonstration and Deployment Project (LSDDP) to demonstrate and validate technologies for tritium decommissioning. The technology interest areas included characterization, decontamination, dismantlement, waste immobilization, worker safety, and tritium particulate management. Examples of equipment reuse included transferring gloveboxes and high efficiency particulate air (HEPA) filters to Waste Isolation Pilot Plant (WIPP), transferring contaminated equipment to a commercial company, and the potential reuse of a stainless steel surge tank. This was complicated by the lack of "as-builts" for much of the equipment. Additionally, although project managers do not want to dispose of useful equipment, the closure contract schedule does not allow time for first of a kind work. The National Metals Recycle Center provided valuable experience and credibility. This removed the first of a kind aspect. Site closure projects present unique challenges because of already compressed schedules, but the process has been simplified by developing written checklists and step-by-step instructions.

Mound also established an innovative contract for vacuum pump recycling. The first step was to assemble an action team and evaluate cost savings ($1.4M). The second step was establishing a barter contract where DOE would send out vacuum pumps contaminated with mercury and tritiated oil for recycling. This involved completing necessary due diligence, packaging, and shipping the equipment. This contract is still in place, but no further action is possible until the metals recycle moratorium is lifted.

Innovative Soft-Sided Waste Packaging System Implementation at a Department of Energy Environmental Restoration/Waste Management Site

John Wolf, R.E.A., Weiss Associates

The Laboratory for Energy Related Health Research (LEHR) is a 15-acre site where radiological studies were conducted on laboratory animals from 1958 to 1988. The primary contaminants of concern are Ra-226, Sr-90, and Chlordane. To date, four Comprehensive Environmental Response , Compensation, and Liability Act (CERCLA) removal actions have been completed, and one is scheduled for FY 2002.

LEHR used various packaging systems prior to establishing lift liners as the baseline system in 2000. From 1996 through 1999 the site employed B-25 boxes, which have a 3 cubic yard capacity. The primary drawbacks of B-25 containers were the void space inside a packed box and the large storage area required for empty boxes. In 1999 LEHR employed super sacks. These are one-ply woven poly bags with a 1-2 yard capacity. LEHR found the capacity to be to small, but John Wolf noted that the super sacks might be well suited to removing debris from buildings during decommissioning.

In 2000, LEHR adopted the Lift Liners packaging systems. Lift Liners are three-ply woven poly bags with a ten cubic yard capacity (8ft x 7ft x 4.5ft) and a maximum load of 24,000 lbs. They are stackable and accepted for intermodal shipments. Additionally, they are well suited for oversized debris and large waste volumes. They are strong-tight containers acceptable for LLW only (i.e. no shielding). When closed, they are secured with 20 seatbelt-like straps.

The required equipment includes a forklift, loading frame, and a lifting frame as well as patch material. Of the 200 super sacks LEHR loaded last year, two were over loaded and required repair. Problems with punctures, tears and rodent damage usually just affected the outer package and were patched. One puncture required that the sack be placed inside another one. They are susceptible to ultra violet (UV) degradation, but are good for six months to one year. The unit cost at LEHR decreased from $497 with B-25 boxes to $322 with lift liners. To date, LEHR has saved roughly $400,000.

Session XVIII - Case Studies of D&D Activities

Disposition of DOE's contaminated excess facilities has become even more challenging as additional facilities with varying radiological and hazardous chemical contaminants have become excess to any further DOE mission. Four safe shutdown case studies were presented in Session XVIII that provided information regarding critical elements to be considered in the planning of D&D activities.

Pre-dismantling Chemical Decontamination of Pipes Cooling Subsystem

Dusan Majersky, AllDeco Ltd.

Since historical data was old and deemed to be insufficient for decommissioning the Nuclear Power Plant A-1 in Jaslovske Bohunice, Slovakia, a radiological characterization of the plant was conducted. It became clear that most of the total dose rate values were coming from two pipes located in the cooling system of the reactor and a decision was made to decontaminate and remove these pipes. A step-by-step pre-dismantling approach to remove the pipes and to decontaminate them prior to decommissioning the reactor was developed. This new approach lowered the radiological exposure rate to the employees and was accomplished at a lower cost than previously planned. The pre-dismantling decontamination approach used a remotely controlled and hydraulically powered saw to remove the pipes and a chemical solution was applied to decontaminate the pipes to the lowest level possible. This approach proved to be a viable option to be used prior to the full decommissioning of the reactor. The radiation dose rate to the employees was lowered by a factor of 20 from what was expected if the piping had been removed during decommissioning of the reactor. Additional information can be obtained from Dusan Majersky at majersky@alldeco.sk.

Development of the Transportable Oversized Waste Reduction System

Ross E. Muenchausen, Los Alamos National Laboratory

The goal of the project identified in the second case study was to deploy an innovative laser cutting system that could reduce the size of large transuranic (TRU) contaminated waste items and large contaminated metal items such as gloveboxes, tanks, etc. This reduction would then enable characterization and packaging of these items in standard shipping containers. Needs for this type of system were established at Los Alamos National Laboratory (LANL), Nevada Test Site, Hanford, and Rocky Flats. The Transportable Oversize Waste Reduction System (TOWRS) was developed based on high-power laser cutting. The laser is coupled to a cutting head in a containment area where the work is actually performed and commercial robotic arms are utilized to eliminate operator exposure during the cutting process. Most of the equipment and controls are located in a 53-foot trailer so it can easily be relocated as required. Certification of the equipment is in process at the vendor facility and deployment of TOWRS is scheduled between May and July 2002 at the LANL Decontamination and Volume Reduction System facility. Information on this system is available by contacting Ross E. Muenchausen at rossm@lanl.gov.

Spent Fuel Identification in Reactor Fuel Storage Basin Decommissioning

Thomas J. Rodovsky, Bechtel Hanford, Inc.

Identification and the removal of spent nuclear fuel (SNF) in a reactor fuel storage basin (FSB) was the subject of the third case study in Session XVIII. F Reactor, shut down in 1965, was one of nine reactors constructed to support plutonium production at the Hanford Site. The fuel storage basin (FSB) associated with F Reactor was partially drained in 1970 and all readily identifiable high-dose items were removed prior to backfilling the FSB with silty-sand. All reactor facility penetrations (except one) were sealed. The one remaining was welded shut but left accessible to inspect the facility once every five years. Cleanout of the FSB began in September 2000 with demolition of the above grade FSB structure. This first phase of the project also removed all but the last 30 feet of the silty-sand backfill. Expectations were that as many as five fuel elements would be found in the remaining 30 feet of backfill during the second phase. In fact, ten elements have been found to date as well as hundreds of "spacers" and "dummy" fuel elements. Laser tracking prisms, high-dose-rate and remote-handled tools were used during the project to locate and remove these elements. Some of the lessons learned from this project were:

- Shutting down a facility does not turn off hazards and risks, it introduces new ones,
- Plan for the unexpected; be flexible to accept change,
- Use proven technologies (simple is sometimes better), and
- Have planned contingencies for equipment, technologies and operational steps that don't work as planned.

More information regarding this project is available by contacting Tom Rodovsky at TJRodovs@mail.bhi-erc.com.

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Hanford's Canyon Disposition Initiative

John Sands, DOE Richland

The fourth case study addressed the Canyon Disposition Initiative (CDI) at the Hanford Site. CDI was developed from a 1995 concept paper in response to the DOE challenge to think out of the box to solve environmental restoration challenges. The U Plant was selected as the pilot for this initiative since it had never been operated for its original design intent and was never used for chemical processing. Five possible alternatives were identified. The preferred alternative is to collapse the building in place. This alternative is the least expensive option due to cost reduction in the disposition of wastes by disposing much of the waste in available interior spaces and grout added to void spaces. This option would also reduce the facility and the surrounding area to the smallest footprint possible. One of the key comments to be addressed is whether or not this new configuration of the building (a mound of dirt covering the facility) was structurally sound and would it survive a natural or otherwise occurring disaster.

More information on this initiative, including the scheduled next steps for waste acceptance at U Plant, is available from John Sands at John_P_Sands@rl.gov.

Strategies for Implementing Innovative Technologies

Presenter: Lindee Berg, Lawrence Livermore National Laboratory

Lindee Berg described two sites that exist at Lawrence Livermore with very different sets of geology, topography and populations and therefore have two sets of needs. The stakeholders were willing to start small with treatability tests of various new technologies, and were content with frequent meetings and progress discussions. The site worked with the regulators to make sure that the documents were written with flexibility. As an example, Site 300 has an interim Record of Decision (ROD), with words actively written to include new technologies as part of the remedy.

The types of technologies discussed included:

- Dynamic Underground Stripping
  - used to remove fuel hydrocarbons
  - steam was injected into subsurface, volatiles were removed from vapors (1993)
- Electro-osmosis
  - targeted clay soils in the saturated zone
  - ions flow to cathode where they can be removed
  - cost effectiveness still unknown
- Catalytic Reductive Dehalogenation (CRD)
  - reduction of volatile organic compounds (VOCs) in tritiated water through a closed loop system
- Iron filings treatment system
  - test during interim phase - used geology to the advantage
  - granular activated carbon - run by solar panels
- Containerized Wetland System (CWS)
  - removed nitrate & perchlorate from water
  - retention time 15 hours, injected acetic acid
- Intrinsic bioremediation of nitrates-
  - naturally occurring nitrate concentrations was increased by military activity to very high levels/evidence of good microbial activity

Questions posed included: Is there a bias for ex-situ versus in-situ? Short answer: A very conservative local water board leans more favorably toward ex-situ remediation techniques.

For further information you may contact Lindee Berg, Lawrence Livermore Laboratory at 925-432-5864.

Phytoremediation and Deep Soil Mixing with Iron Addition at Argonne National Laboratory

Andrew Gabel, Argonne National Laboratory

Andrew Gabel first presented a description of the site and of the waste operations area. The main problem addressed in this presentation involved solvents discharges into french drains and landfill in area of glacial till with a shallow aquifer. Contaminants included VOCs , dense non-aqueous phase liquids (DNAPLs), and concentrated tritium. Deep soils in this area complicated the issue. The remediation was conducted under Resourse Conservation and Recovery Act (RCRA) and the plume had migrated offsite.

Many options were considered. To buy time, the site used pump and treat until other remedies could be investigated. In 1998, DOE funded an innovative technology focusing on deep soil mixing with iron addition at the 317 Area. The iron addition resulted in prompt contaminant destruction. This project started as removal but turned into a treatment. Deep soil mixing destruction of VOCs was 80%

After the iron addition, a plantation of approximately 8000 trees was planted . The plantation was designed to mitigate residual contamination and to provide future hydraulic containment. This approach was expensive from a capital point of view. Willow and poplar trees were chosen and the root systems were targeted to areas of higher concentrations. The growth in the first season was exceeded by the second; the trees are pumping minuscule amounts of tritium into the air.

Stakeholders loved phytoremediation. The project has won awards, and the plants continue to do well. Tissue studies show that the process is working- better data for impact on groundwater quality are probably several years out.

The remaining issues include boulders and hot spots left untreated. Additionally there are very restrictive ground water cleanup standards and ongoing care and maintenance of the trees.

Overall, both approaches of phytoremediation and iron addition can be quicker and cheaper than conventional methods.

Questions posed included: What was the iron form? The zero valent iron was a powdery material mixed as a slurry. As steam was injected, the temperature and moisture made remediation faster.

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For further information you may contact Andrew Gabel, Argonne National Laboratory at 630-252-2213.

Dynamic Underground Stripping at the 321-M Solvent Storage Tank Facility

James J. Kupar, Bechtel Savanna River Inc.

Dynamic Underground Stripping (DUS) was deployed to a coastal plane area to treat chlorinated solvent discharges. The application of DUS is part of the RCRA ground water strategy to destroy source term DNAPL, primarily tetrachloraethylene.

The DUS vaporizes VOC's in the permeable zones of the treatment area by injecting steam into the subsurface, thereby heating contaminants to above their boiling points.

DUS was developed by Lawrence Livermore National Laboratory. DUS at Savannah River is above and below water table and was targeted to a precise area of free non-aqueous phase liquid (NAPL) as an isolated source. The DUS proved to be 75 times more effective than pump and treat.

Mr. Kupar presented an interesting video depicting the steam injections- one in the ground water, two in the vadose zone with two components on unit. ERT- electrical resistance tomography and temperature monitoring was used to delineate a pattern of resistance and to map location of steam fronts.

DUS removed 70000 pounds of VOCs quickly but not cheaply. The lessons learned- permit limits help back remediation, greater success could have been realized earlier; processes knowledge of injection into different lithologies was gained ; contract success criteria was defined as product removal versus heating criteria success; needed successful shut down criteria to be defined and the efficiency of hydrous/pyrolysis oxidation (HPO) process is hard to quantify. Approximate cost ; TPC 5 million

For further information you may contact Jim Kupar, Bechtel Savannah River at 803-952-6403.

Combination Air Sparge/Soil Vapor Extraction System at Mound OU-1 Site with System Operation through On-site Process Monitoring

Gary Brown, Sandia National Laboratories

Gary Brown first provided a description of the a small 4 acre capped landfill with VOC's in vadose and saturated zones located at the Mound facility. Pump and treat was chosen initially with a time line of 20 years. Innovative Treatment Remediation Demonstration Project (ITRD) became involved in 1995. System operations startup was in December 1997 through February 1999. The full scale deployment cost 1.5 million dollars for 3500lbs removal.

The Soil Vapor Extraction/Air Sparge (SVE/AS) system consisted of valved extraction wells, valved french drains, and air injection wells. The valves allow operators to adjust airflow for individual well optimization based on real time information flow provided by an online gas chromatograph system.

The system operated in two zones. Leesons learned included: do not use a 50 micron screen - kept getting plugged and the need for more air sparge wells, further from extraction wells.

At this site there was considerably more VOC than originally estimated. The total VOC estimated from pump and treat in three years was approximately 30 pounds. The total VOC extracted by SVE/AS in 2.5 years was approximately 3500 lbs. The most reduction occurred in the first 2500 hours . Significant rebound after shutdown has not occurred.

For more information please contact Gary Brown, Sandia National Laboratories at 505-844-0968.

ROD Amendment Replaces Pump and Treat with Bioremediation and Monitored Natural Attenuation at a Large INEEL TCE Plume

Kent Sorenson, Northwind Environmental

Kent Sorenson started his presentation with a description of the Idaho National Engineering and Environmental Laboratory (INEEL) site and the contaminated plume of trichloroethylene (TCE). He focused on the process to get to the ROD amendment. He showed graphics depicting the injection well showing a TCE plume two miles long. This ROD was signed in 1995, with pump and treat was chosen as a default remedy, but included within the ROD were descriptions of five specific technologies to be evaluated in parallel. At each decision point in the evaluation process, the regulators were involved.

Rules for applying in situ bioremediation were discussed. At the Test Area North (TAN), bioremediation was a reductive dechlorination pathway. This was heavily analyzed. A graphic presented showed the conversion from TCE to dichloroethylene (DCE) and finally the conversion to ethene using injection of sodium lactate.

A series of slides showed the dramatic reduction of TCE in the environment by using this technology- given the name Bioavailability Enhancement Technology- as compared to 18 months of pump and treat. As compared to pump and treat, Bioavailability Enhancement Technology is both cheaper and faster, although not as fast as some other technologies.

A presentation on measurement of Natural Attenuation was presented for using tracers such as tritium and perchloroethylene (PCE). The role of dispersion was considered, because rate of dispersion decreases over time. In regards to natural attenuation, existing microorganisms were discovered that degrade TCE over time, primarily through oxidative mechanisms.

An amendment to the ROD stating bioremediation for TAN source area and Monitored Natural Attenuation for the majority of the dissolved plume as a replacement for pump and treat was signed at in September 2001. Final remedial design is being prepared. The estimated cost savings to DOE over 30 years is 15 million dollars.

For more information please contact Kent S. Sorenson, Jr. at NorthWind Environmental , Inc. at 208-528-8718.

Legacy Risk Measure Input to Long-Term Stewardship (LTS) Decision Making

Steven A. Eide, Idaho National Engineering and Environmental Laboratory (INEEL)

This risk model was still in development. At the time of the presentation there were no success stories for environmental restoration/waste management (ER/WM) activities at INEEL. The presentation covered five primary points of legacy risk measures that need to be incorporated into making LTS decisions: risk model concept and uses (ESHRAP code), legacy risk measure, preliminary examples of risk model use, applications to long-term stewardship, and future work.

The Environmental Safety and Health (ES&H) Risk Model Concept uses two different assumptions for the modeling of ER and WM activities, activities by risk and waste/material by risk and performance of risk benefit and cost comparisons. This model would be of benefit to INEEL management, other DOE sites, and the stakeholders. The ESHRAP code is used as a basis in this risk model. This model can evaluate long-term risk from waste/material at any point in its lifecycle. Several graphs depicting preliminary and potential applications and analyses at a number of sites using transuranic (TRU) waste were presented.

How to write an LTS Plan: Ask the Community

Joe Estrada, DOE/Kirkland Area Office (KAO)

For Sandia National Laboratories (SNL) the process for writing a Long-term Environmental Stewardship Plan originated about one year ago with personnel from the KAO and SNL. This was based on the original plan to close SNL in FY 2003, however, due to funding constraints, site closure is estimated to be FY 2008. The overall process included writing the SNL ER Project Closure Plan, conducting a review of LTS guidance and literature, summarizing key categories, presenting the proposed approach to management, and consulting with the public. An outline of the process was presented to a number of community groups (May 2000 meeting) and included discussions on information management, institutional controls, monitoring, maintenance, management and community involvement. At these meetings it was important to state (up front) the purpose, scope, and assumptions used in the plan primarily due to the diversity of the people involved. This integrated concept and planning process included a Site Specific Advisory Board (SSAB) and had three major task groups; Site and Environmental Monitoring, Institutional Controls Information Management, and Long-Term Maintenance/LTS which was very helpful in dealing with the public. The site found that it worked best for all information to flow through the SSAB and to use two ad hoc working groups to develop the LTS plan. Also, a Resource Information Office was a significant factor in facilitating the process.

The meetings were both formal and informal. SNL found small group discussions were very effective and contributed to the process.

Sandia Mixed Waste Landfill is a subject of concern to many of these people and often these meetings (when public) served as a forum for non-radiation contamination and support of more cleanup. Task groups met monthly to discusse objectives and recommendations. Task groups got together to discuss ideas (informal workshops) and prioritize and rank plan contents into six points. These meetings became know as the convergence process which included the following points: update periodically; open timely; keep public involved of how, who, when; ensure funding to do LTS; define and maintain roles and responsibilities; promote interagency cooperation; and include contingency plans.

The website (www.sandia.gov/itscenter) served as a good communication tool. This website was developed during the process and provides information on LTS and other related activities. Next Steps in the drafting of the LTS Plan include working on selected LTS issues, redrafting the plan, and pilot the LTS project.

Transition of Long-Term Stewardship Responsibilities from EM to NNSA: A Site-Specific Pilot Study

Deborah D. Griswold, DOE/AL, Warren Cox and Richard Fate, SNL, and Bobbie McClure, NV

The first question presented was "Why transition of LTS?" Answer: December 15, 2000 memo signed by Deputy Secretary T.J. Glauthier establishing Departmental policy regarding responsibility for LTS. What Does the Policy Require? First, that the EM Mission completion is agreed to by both EM and landlord entities. Three conditions have to be met: 1) Planning LTS Plan and Current Operating Baseline completed, 2) Funding - Budget Authority Transferred, and 3) Accountability - MOA signed at HQ level.

AL proposed to go where no other site had gone before, by submitting a pilot project proposal (May 2001) to the Office of LTS to transition the SNL California LTS responsibilities from EM to the National Nuclear Security Administration (NNSA). No other DOE site had transferred a site back to a DOE landlord program. This site was selected because the EM mission was completed in 1999, it was geographically separated from SNL/AL, minor LTS activities remain with little resource requirements, and NNSA, the site landlord, was willing

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to support the pilot transfer. A brief history of the site was presented with an explanation of the differences between landlord LTS related activities and what the EM remediation project entailed. One primary reason to turn back to landlord program is that they already do some of these activities and are responsible for site monitoring.

This Pilot Project Approach consists of developing two diverse teams, a core team and a strategic team; partnering with the Nevada Operations Office; establishing the Site-Specific Plan and providing HQ with a Draft Memorandum of Agreement (MOA) to be completed in March of 2002 (a relatively aggressive schedule). Challenges to the success of this pilot are addressing vulnerabilities in the MOA, NNSA buy-in scope, regulatory close-out/transition to LTS, public expectations, and uncertainty on any site-specific activities.

Financial Risk Analysis of Rocky Flats Long-Term Stewardship Costs DOE Rocky Flats Environmental Technology Site

Denise Dierley, Applied Science Laboratory, Inc.

The material in this presentation was based on experience obtained from the Uranium Mill Tailings Remedial Action Program (UMTRA), as well as related LTS experience and a potpourri of concerns on LTS issues. The speaker noted that the LTS environmental activities are a very different kind of program for DOE to manage.

There are several decision making considerations before entering into LTS; how to manage the long-term uncertainties; looking at 100-200 year future impacts, the number of environmental communities, whether to include cautionary principles in developing policies; and documenting data collection and information decisions. The technology does not bail you out if it is not available. Institutional management should be used to make sure all things are in place to ensure success of the LTS program you want to begin. Always remember there are different types of stewardship activities at the individual sites. Also, often the government is the landowner at larger sites, whereas many of the small sites (mill tailings) have private owners with more and different issues (land transfers).

From experience at the UMTRA sites, it is helpful to know what constitutes failure (before not after) sites are remediated. It is necessary to define the performance monitoring requirements: is the remediation working the way it should, when is the right time to turn monitoring over to landowner, and how will it continue? Be sure to work with regulators and establish acceptable limits and always consider monitored natural attenuation. Look at what it will cost for LTS (number of wells, number of constituents, data collection and analysis) monitoring because it can be very expensive and extend the project out. To make LTS work, clarify on-site versus long-term site contamination needs and make off-site institutional controls robust. It is acceptable to have some quality assurance redundant systems (human system controls). Ensure there are periodic reviews like the CERCLA Five Year reviews. These and other reviews can be site specific and depend on the plan. It is important to establish values like picturing blue sky/wheat fields, etc. as end states. Values to consider are individual and can be internal/external to the agency. Some of the LTS values are similar across DOE, but there are many site-specific values. The next thing to consider would be the implementation of the LTS program. More policies are written than ever implemented, because it is difficult to make policy work and get buy-in. Basically implementation is where the rubber meets the road. Another key component of LTS is to have corporate knowledge, where history versus contemporary decisions dealing with experience and technology can make a difference.

Model for Regulatory Participation to Manage CERCLA Decision Uncertainties

John Kubarewicz, Bechtel Jacobs/ Restoration Services Inc.

John Kubarewicz described the lack of a clear path forward for the site wide soils and sediment actions and for Building 81-10. The site chose to focus on two issues: the factors of cost and effectiveness of remediation.

The Oak Ridge site chose a two phased approach - technical and regulatory. For the technical side, additional data to support decisions was collected, including tracer studies and treatability studies. Different sources of funding were tapped to support this project, such as the Oak Ridge Operations Office EM cost sharing, out year funding for multiple phases, MSE Applications, Inc., National Environmental Technology Laboratory, Subsurface Contaminants Focus Area/Mixed Waste Focus Area Technical Support and the EPA Cincinnati Research Laboratory.

A checklist was provided on how to get regulator buy-in which included: having a workshop on data quality objectives to set clear goals; having technical approaches remain open; having the plan as a Federal Facility Agreement (FFA) deliverable; and using multi-agency technical support.

Agreed upon tracer studies were inconclusive, as few samples failed the Toxicity Characteristic Leaching Procedure (TCLP). The operating assumption was that more would fail. Three awards for remediation approaches were given for chemical stabilization, electro-chemical work, and chemical stabilization.

Lessons Learned from this process showed that teamwork worked, CERCLA provided the framework for dealing with uncertainty, funding support was available in "tight" times but they needed a year in advance to work on getting it, it is best when treatability studies are part of ROD, and when additional technical resources, especially Cincinnati EPA support, are available.

For further information you may contact John Kubarewicz, Oak Ridge Operations Office at 865-241-3844.

Planning for Stewardship at the Hanford Site: The Story of the Hanford Comprehensive Land Use Plan Environmental Impact Statement (EIS)

Thomas Ferns, Tanks Focus Area, Richland Operations Office

"EIS is a good thing" states Tom Ferns as he began his presentation on the Land Use EIS at the Hanford site. Through a series of graphics, land use options at the Hanford site was depicted.

Stakeholder involvement began as a citizens advisory group of approximately 60 people for 6 months working on the ER waste management EIS. This became the future site use working group, a model for stakeholder involvement that was used for Navy base closures in the Philippines and other projects.

There were two revisions of the EIS, the first being the Hanford Remedial Action EIS (HRA-EIS). Public comment on the HRA-EIS required the creation of the Hanford Comprehensive Land Use Plan Environmental Impact Statement (HCLUP) . Within the HCLUP, original HRA-EIS language had to be changed to adapt to state laws because the exact terminology became important. In the original document, regulators and stakeholders used unrestricted use for anything they wanted as opposed to simply equaling residential use. This needed clarification in the HCLUP. Grazing had to be called out as a specific reserved treaty right for the Tribal nations.

DOE fired the contractor and basically took control of the document. In response to the needed changes, all cooperating agencies were allowed to write their own sections, in their own voice.

An important part of the EIS was the establishment of a process to deal with proposed land use changes. A review process was set up for use requests with procedures to transfer land and make deed restrictions. The realty officer, currently Jim Daily, makes sure land use is believable and credible to support institutional control. Even with procedures in place, the local governments have high turnover of staff and internal communication issues. Coordination with internal agencies still needs improvement to smooth the process.

Jim Daily is in charge of today's issues, along with John Sands. The EIS led to the establishment of the Hanford Reach National Monument and National Wildlife Refuge and provided a path for alternative clean up levels in the areas designated industrial in the Land Use Plan. Some items still need to be pursued further, such as cleanup standards for wildlife. These cleanup standards can be more restrictive than human clean up standards and have the potential to require additional resources.

For further information you may contact Tom Ferns, Richland Tanks Focus Area at 509-372-4512.

Stakeholder Participation in INEEL Long-term Stewardship Planning

Sam Alessi, Idaho National Engineering and Environmental Labortory (INEEL)

Sam Alessi presented a new approach to stakeholder participation that is being sponsored by INEEL in hopes

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of creating a more robust long-term stewardship plan for the site. This approach adopts a new method of using anthropology with family systems therapy and applies it to understanding stakeholder beliefs that lie behind contentious issues.

The historical context of how people approach decision making in society was discussed. This historical understanding shows why the current trends for involving stakeholders is a natural effect of moving from a modernist to a post-modern social structure. Next it was shown how the stakeholder approach being used can be considered scientific in this new post-modern sense.

The approach focuses on an analysis of the interactions between each of the stakeholders, so that underlying cultural beliefs are revealed. The researchers capture the entire narrative of the focus group by tape recording the sessions. This differs from other approaches that mainly capture the major points discussed. This inquiry style focuses on individuals and the relationships between them.

The methodology included the following steps: identification of stakeholders; holding of focus sessions to explore responses through groups of up to 12 people; transcription of meetings; construction of a model of interaction between the stakeholders; listing of findings or patterns; and finally the feedback of findings back to the group which helps the group to "own" and acknowledge the information.

By use of a post modern scientific approach to discover the domains that bound the situation, this research may lead the way to involve stakeholders more fully in the stewardship process. This research will continue into 2002.

For further information please contact Sam Alessi, INEEL, at 208-526-1136.

Interfacing with Generators and Carriers on Stakeholder Transportation Concerns

Ken Small, DOE/NV Waste Management Division

Ken Small started his discussion with background of the Nevada Test Site, which had informal disposition of waste since the 60s. A transportation incident from a Fernald shipment increased visibility of shippers nationwide. By law, carriers are to chose routes; DOE has no authority to direct routes. The big issue with NTS is having specific routes avoid Las Vegas and the Hoover dam.

NTS has developed stakeholder trust through two EISs, a CERCLA analysis, and intermodal studies. DOE/NV developed a policy commitment to the State of Nevada, which requests those generators shipping to the NTS to avoid the U.S. 95 and I-15 interchange, Hoover Dam, and heavily populated areas of the Las Vegas Valley. DOE monitors shipments and routing forms - shippers must disclose routing. NTS gives a quarterly transportation reports which goes to a working group and California and Nevada Legislators and is posted on the internet

As compared to 1997, when 100% of all NTS inbound shipments crossed the Hoover dam, now Hoover Dam crossings constitute less than 1% of shipments.

For further information please contact Ken Small, NNSA/ Nevada Operations Office at 702-295-1933.

Optimizing the Voluntary Corrective Action Process Through Team Building

Mark Sloan Thacker, Sandia National Laboratories (SNL)

Voluntary corrective action (VCA) at Sandia are typically a low cost short term action that can go forward without regulatory approval. Sandia performed three, with different contaminants, at solid waste management units on Kirkland Air Force Base.

They used a team approach and combined planning, reporting and implementation. The New Mexico Environment Department Hazardous Waste Bureau, and Oversight Bureau were co-located. They were involved up-front in planning, approved preliminary remediation goals, provided weekly oversight, had meetings on key decisions, and interfaced and agreed on technical impracticality of removing petroleum contaminated bedrock. They approved all action as final remedies.

SNL/NM management is very proactive and its technical team came up with an approach to do three at once, involving moving schedules up for two projects. A risk assessment team was also involved. They developed the preliminary remediation goals, determined the proper analytical methods and sampling requirements, and provided timely evaluation of data acceptability.

The major accomplishment was that in one six month period three VCAs originally scheduled to be conducted over two fiscal years were completed. Overall costs were 15% under original budget despite huge increases in waste volume. These projects showed the value of stakeholder buy in, team participation, clear commitments to follow through, and the ability to streamline existing processes.

For further information please contact Mark Sloan Thacker, Roy F. Weston, Inc. at 505-284-2617.

The Nochar® Technology Development Program, Providing a Proven Method Worldwide for Hazardous Waste Solidification and Stabilization

Ward G. Brunkow, The Chamberlain Group

A product has been designed for use in the nuclear environment that will absorb lubricants, organics, solvents and other hydrocarbons with a mixture of high tech polymers. The initial nuclear application of this technology was at the Mound site in Ohio where tritiated pump oil contaminated with mercury was solidified. The oil, which was used in gloveboxes, did not require mixing to solidify and passed both Toxicity Characteristic Leaching Procedure (TCLP) and durability tests. It was contained and solidified in lined drums and is scheduled for disposal at the Nevada Test Site. Additional nuclear deployments are underway at Ashtabula, Sandia, Rocky Flats, Atomic Energy of Canada, and Los Alamos National Laboratory. Successful testing of Nochar has occurred at Ashtabula and Sandia with organic liquids and with transuranic (TRU) oils at Rocky Flats. The objective at the Atomic Energy of Canada Laboratory (AECL) was the solidification of approximately 5,000 gallons of rad contaminated oil that was used as reactor coolant in nuclear power plant prototype testing in the 1950s. The deployment provided excellent results and AECL has started a formal approval process to establish solidification/stabilization with Nochar as a new long-term storage solution in its plans to decommission its laboratory there.

For more information contact Ward Brunkow, The Chamberlain Group, Ltd. at 703-929-1280 or wbrunkow@chamberlaingroup.net

Retrieval and Closure of Inactive Waste Tanks at Oak Ridge National Laboratory (ORNL)

Barry Burks, The Providence Group

The ORNL Inactive Tanks Program vision is to (1) complete the remediation and closure of the ORNL Federal Facility Agreement Inactive Tanks in accordance with the Action Memorandum by the end of FY 01 and (2) complete the stabilization of the eight largest Gunite and Associated Tanks in accordance with the Action Memorandum by the end of FY 01. Both of the FY 01 objectives have been met. The various technologies used to accomplish the remediation and closure of the inactive waste tanks are summarized below.

- Due to deteriorating conditions in Tank W-5, Flygt Mixers were installed to perform waste mixing. The Flygt Mixers developed high axial flows, which mobilized and suspended the sludges into readily pumpable slurry. Although the Flygt Mixers left more solids in the tank than the robotic equipment used in other gunite tanks, they were sufficiently effective to close the tank.
- For waste retrieval operations in Tanks 3003-A and WC-9 use of a Mobile Pulsed Jet Mixing System was planned. While employed at Tank 3003-A, the system clogged and operations were suspended. A lesson learned during this operation was that the Pulsed Jet Mixing System must be flushed at the end of daily operations to avoid the pulse tube from becoming clogged.
- There were a number of small tanks scattered throughout the facility. The key to successful operations here was the use of a high integrity container to collect the waste from the small containers and then transfer the collected waste to the consolidation system.
- The technology used for Tank TH-4 was a Russian designed and fabricated Pulsating Mixer Pump. This was the first deployment of the Russian technology and although it worked very well, it was a logistical challenge.
- The Old Hydrofracture Facility Tanks contained fairly hot material. The technology used for waste retrieval in this operation was the Borehole Miner Extendable Nozzle.
- The Gunite Tanks Remediation Project involved retrieval and transfer of TRU sludge and liquid low-level waste from eight tanks in central ORNL. The types of technologies used in this remediation project included:
  - Waste Dislodging & Conveyance System for dewatering the sludge and performing waste retrieval operations
  - Modified Light Duty Utility Arm for performing characterization, wall scarifying, and waste retrieval operations
  - Houdini I & II Remotely Operated Vehicles for entering the tank, plowing sludge and picking up debris

The average time to remediate the small tanks was 2-3 weeks, and 5-6 months to remediate the larger tanks. The ORNL Inactive Tanks Program activities have cut approximately 13 years off the baseline schedule and $191 million off the baseline costs.

For more information contact Barry Burks, TPG - Applied Technologies at 865-218-8705 or blburks@tpgat.com.

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Removal of Uranium from Ground Water using Granular Activated Carbon Modified with Hydrophobic Areogels

Sabre Coleman, Lawrence Livermore National Laboratory

Lawrence Livermore National Laboratory (LLNL) Site 300 is an explosives testing facility. Tritium and depleted uranium contamination at this site has impacted the ground water. DOE has agreements with EPA to clean up the ground water. Current methods of contaminant removal that have been applied at the site include granulated activated carbon (GAC), ion-exchange resins, air strippers, and bioremediation. None of these has provided an approved cost effective method for removing uranium from the ground water.

Research at LLNL has yielded a GAC and chemically modified hydrophobic silica aerogel composite that, based on laboratory tests, is effective at absorbing uranium from aqueous solutions. The GAC from the composite can be reused and the composite is competitive with other absorbing materials. Testing of the composite for absorbing volatile organic compounds (VOCs) was also conducted. It was concluded that modified composites could be a preferred method for both uranium and VOC clean up.

For more information contact Sabre Coleman, Lawrence Livermore National Laboratory at 925-422-3430 or coleman2@llnl.gov

An Independent Analysis of a Glovebox Glove Failure Incident

Michael E. Cournoyer, Los Alamos National Laboratory

Analytical chemistry and metallurgical studies on samples of plutonium and nuclear materials are carried out in nuclear research facilities, as part of the DOE's nuclear weapons program. Programmatic activities include waste minimization, environmental restoration and remediation, nuclear safeguards, high-temperature superconductivity, support for the Rocky Flats site, mixed waste characterization, support for the Waste Isolation Pilot Project, and Special Nuclear Material (SNM) standards development. One of these activities involved recovering highly enriched uranium and separating out Resource Conservation and Recover Act (RCRA) materials to facilitate disposal of the mixed waste. Approximately 100 kilograms of waste was to be processed under the study. The initial work involved recovering highly enriched uranium and separating out RCRA materials to facilitate disposal of the mixed waste.

During one of these activities, three trays of 99Tc contaminated solutions were being evaporated from neutralized nitric acid solutions placed on hot plates inside two gloveboxes. The intent of the task was to reduce the volume of the solutions by evaporation, dry any solid residues, and then dispose the residues as a potentially mixed waste. At some point during the evaporation, the glovebox became pressurized and a glove ruptured resulting in widespread contamination of equipment, work surfaces, and the floor. The resulting general-area contamination levels ranged from 60,000 to more than 1,000,000 beta disintegrations per minute/100 cm^2. No personnel were exposed during this event and facility contamination was limited to two rooms.

Subsequent analysis of the solution and residues, differential thermal analyses, and analysis of the glovebox and glove revealed that the direct cause of the incident was the overpressurization of a glovebox due to a rapid but non-explosive decomposition of chemical compounds while subjected to heat.

The most significant lessons learned from this incident were:

- Adjusting the temperature of the hotplate (cost ~$150) such that the temperature of evaporation is never above 80°C does not guarantee that higher temperatures will be reached once the solution has evaporated to dryness.
- Temperature controlled hotplates that maintain the set temperature either at the plate surface by an internal Type K thermocouple sensor, or in the solution is required over a voltage power controller.
- An improvement on Lessons Learned 2 is using a heating device (Infrared Lamp) designed such that 210°C cannot be reached under any circumstances.
- A still pot thermometer is also required to prevent the solution from evaporating to dryness and generating low-density areas such as bubbles.

For more information contact Michael Cournoyer, Los Alamos National Laboratory at 505-665-7616 or mec@lanl.gov.

Recovery of Tritium from Mixed Waste Liquids

Robert Gallagher, Kinectrics Inc.

Mixed waste presents special kinds of problems for treatment, especially when it contains tritium. Kinectrics, Inc., under contract to Nuclear Services and Sources Inc. (NSSI), is attempting to circumvent these waste problems by designing a commercial recycling facility that will recover the tritium from mixed waste liquids. This technology is begin driven by large pharmaceutical companies, which have generator concerns over the long-term liability associated with this waste type.

The facility comprises (1) an oxidation subsystem to convert the mixed waste to carbon dioxide and tritiated water, (2) a water conditioning facility to prepare the water for electrolysis, (3) an electrolysis cell to reduce the water to hydrogen gas with an apparatus to trap any tritium, and (4) an isotope separation subsystem to recover tritium as gas.

The key to this system is to be able to take the stream of hydrogen and recover the tritium from this stream. In the stripping mode, the GC Hydrogen Isotope Separation System can handle up to 8000 L of hydrogen per day. After the stripping mode, the tritium is stored on uranium storage beds until it is enriched. The enriched tritium can then be returned back to the pharmaceutical company.

For more information contact Robert Gallagher at 713-641-0391 or rgallagher@nssihouston.com.

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Results and Lessons Learned from the Chemical Waste Landfill Excavation, Sandia National Laboratories, New Mexico

Sharissa Young, Sandia National Laboratories

The Chemical Waste Landfill (CWL) at Sandia National Laboratories accepted chemical waste from internal research activities from 1962 until 1985. Excavation of the 2-acre CWL began in 1999 after TCE was identified in the ground water. The first step in the process was the screening of excavated soil from the landfill contents. In July 1999, after initial activities had begun, the entire process was re-engineered - powered sifting screens were brought in and a risk-based approach was developed. This allowed for more focused excavation in the highly contaminated areas of the landfill.

During the segregation process, radiological screening was conducted. Over 2,000 chemical containers with unknown contents were found, as well as over 350 intact compressed gas cylinders, over 900 thermal batteries and several hundred chemical batteries, and 30 munitions pieces. Some debris items were contaminated with depleted uranium. The largest waste streams were rocks and soil, 1,000 and 50,000 cubic yards respectively. All debris was removed from the CWL on June 7, 2001. The excavation costs to date are $16 million. Future activities include defining the extent of polychlorinated biphenyls (PCBs) in the landfill, characterizing the remaining chemicals and debris, and backfilling the excavated site.

There were a number of lessons learned over the course of this project. First, regarding physical space for site activities, it is recommended that at least five times the size of the landfill is required for operational space. Second, plan for flexibility and continuous improvement opportunities before the project begins. Third, identification of as many of the waste types as possible will be beneficial, as the costs of disposal will outweigh the costs of excavation. Fourth, the risk assessment process proved to be a cost savings measure. Fifth, there were a number of ergonomic adjustments made to increase worker safety and efficiency (e.g., shielding from the weather, air line respirators instead of tanks, stools). Finally, there are many problems encountered at DOE sites that are not unique. If you take a step back, there is evidence of similar issues, which can be learned from. In this case, lessons were learned from a burial ground remediation project from Hanford.

For more information contact Sharissa Young, Sandia National Laboratories at 505-284-6185 or sgyoung@sandia.gov.

Recent Progress in Collecting and Assessing Technology Costs

John Kingscott, U.S. Environmental Protection Agency

Mr. Kingscott shared information on the Federal Remediation Technology Roundtable (FRTR) initiatives and its latest efforts. One product of the FRTR is the Cost and Performance Report that provides data on cost and performance of remediation technologies from full and large scale and cleanup projects. Currently, there are approximately 274 case studies that have been developed. These case studies range from sites contaminated with metals, radioactive waste, solvents, pesticides, and explosives contaminating media such as soil, solids, and ground water. Technologies that have been studied include soil vapor extraction, in-situ soil treatment, incineration, and other in-situ and ex-situ treatments. Data have been compiled for six cleanup technologies. Based on available data, cost curves for these technologies have been developed which provides unit costs for volume or amount of waste treated.

For more information contact John Kingscott at 703-603-7189 or kingscott.john@epa.gov.

CostRisk and Area Cost Factors

Stan Hanson, U.S. Army Corps of Engineers

Mr. Hanson discussed the CostRisk software developed by DOE, U.S. Army Corps of Engineers (USACE), the Air Force, and the Navy. CostRisk is a risk analysis program for determining project risk. To use CostRisk, the users develop three estimates; "best," "expected," and "worst" that represent estimates that are under best case scenario, most likely scenario, and worst case scenarios. These estimates can be developed using RACER, PACES or a stand-alone estimate. After these estimates have been developed, the CostRisk software acts as a bridging software between RACER or PACES and Crystal Ball Monte Carlo program. The CostRisk output is an Excel contingency report. The next steps include developing the capability to use CostRisk with MCACES estimating tool and to develop training for CostRisk.

Stan Hanson also provided a brief overview of the environmental Area Cost Factors (ACF) study recently completed. ACF are dimensionless numbers representing relative costs between locations. To obtain the DOE ACF, 29 sites were used to develop the material, labor, and equipment index, and the Matrix Factors which measure effects of climatic and weather conditions, life support/mobilization, contractor's overhead and profit, and labor availability. Blue-collar labor rates were based on DOE Project Labor Agreements, Davis-Bacon, or prevailing wage rates. Professional salaries were obtained from www.salary.com. Equipment rates were based on USACE data, and the material rates are based on two vendor quotes. The baseline average ACF is 1.00. This is based on average of 9 selected Base City locations (SRS, OR, Los Alamos, ID, Hanford, Fort McNair, SPRU, RF, and Fernald). The next step for the ACF study is to include these results in RACER estimating tool.

For more information contact Stan Hanson at 402-697-2609 or stanley.l.hanson@usace.army.mil.

Sharing Environmental Restoration Life-Cycle Cost Models via an XML Library

Bill Hombach, U.S. Navy

Mr. Hombach gave a presentation for the U.S. Navy on their effort to pursue standardized, open structure Internet cost models. There is a need to share cost information between agencies, to foster competition, and to provide a consistent data for cost analysis. The solution for those needs is to establish parametric cost model standard, an electronic standard, and a cost library or repository. The Navy suggests that agencies use eXtensible Markup Language (XML) for data definition, transmission, application, and for maximum interoperability between systems. Using XML, agencies can establish a central repository for cost models, cost data, and cost estimates. The Navy has started with development of this system and has numerous cost estimating relationships (CERs). Because the Navy is using the Berkeley Software Distribution License, these CERs and cost data are available to use by anyone for any purpose as long as long as the Navy is given credit as the original authors/agency and that the names of the author/agency are not used to promote or endorse the derived product.

For more information contact Robert Nash of the Navy at 805-982-4304 or nashra@nfesc.navy.mil.

The Developing Role of Cost Estimation within SCFA's ITRD Program

Jim Studer, Consulting and Funding Resources, LLC

Mr. Studer gave an overview of the Innovative Treatment Remediation Demonstration (ITRD) Program, whose goal is to develop cost and performance data, and to accelerate deployment of innovative characterization and remediation technologies. Factors affecting cost estimates for ITRD projects include vendors not familiar with DOE sites, vendors not providing complete or accurate data about technologies, and poorly defined clean-up goals. Thus, costs provided

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by vendors versus site costs are very different. Recently, the role of project manager as defined in the DOE Order 413.3, acceleration of site closures, emphasis on life-cycle cost estimating, and Congressional and Office of Management and Budget (OMB) inquiries into innovative technologies cost savings have led to placing higher importance on Engineering Cost Analysis (ECA). Some desired uses of the ECA is to support the quantification of cost savings from innovative technology use, promote consistent and comprehensive estimates, promote risk management, and utilization of existing tools (i.e., ECES, ECAS, IDEAL, RACER, etc). The IDEAL system is currently being tested as a possible tool to support ECA needs.

For more information, contact Jim Studer at 505-858-3136 or funding_resource@msn.com.

Ohio Cost Savings Pilot Program

Richard Grovers, Chamberlain Group

Mr. Govers gave an overview of the Ohio Cost Savings Pilot Program. This program began as the Ohio soil and sludge initiative and combined the Technology, Pollution Prevention, and the Waste Minimization programs to form the Ohio Cost Savings Group (OCSG). The OCSG has four networking teams and five contractor led teams that focus on specific areas such as D&D or materials management. OCSG cost saving initiatives include the disposal and reuse of contaminated equipment, coordination and maintenance of equipment database, identifying technologies or processes that saves money, and other activities.

For more information, contact Doug Maynor at 937-865-4402 or doug.maynor@ohio.doe.gov.

Environmental Liabilities (EL) Audits

Bryan Skokan, DOE/EM Office of Site Closure

Mr. Skokan stated that the EM Program and other Federal Agencies are audited annually on the EL cost estimates. Some of the audit findings and lessons learned include lack of documentation and details on estimates, gaps in estimates, incomplete estimates, and inconsistent contingency estimates. There are several tools available for DOE and other agencies that can be used for EL estimates. Some of these tools include RACER, Navy's Cost to Complete systems, and CostRisk software. Additionally, EM has developed a checklist and a comprehensive guideline for EL estimate development. It was noted that these tools are free of charge to other Federal personnel and for some contractors. For the future, the Interagency Environmental Cost Engineering Committee is planning on developing EL auditing standards, and will continue to update and modify existing estimating tools.

For more information, contact Bryan Skokan at (301) 903-7612 or bryan.skokan@em.doe.gov.

Structuring the Cost Analysis of Innovative Technologies to Improve Their Value to DOE

Gorden Huddleston, MSE Technology Applications

Mr. Huddleston stated that previously limited attention was paid to technology cost. There were problems such as incomplete cost data collection, poor cost details, and fixed-price contracts not requiring reporting requirements. Also, since baseline technologies have not been identified or the baselines were inadequate, technology cost savings were difficult to determine. Sites also risk reduced funding if more cost-effective technology is included in the baseline. Thus, there is a need to define work breakdown structure including items for support and ancillary costs, and to develop comparable life-cycle costs. The Interagency DNAPL Consortium (IDC) approach requires vendors to report cost using HTRW WBS and to comply with Federal Remediation Technology Round Table (FRTR) and Nation Energy Technology Laboratory (NETL) guidelines. Plus, cost per unit contaminant removed and cost per unit volume is requested and contracts require vendors to provide a scalable technology cost model. The IDC will develop and report results of two baseline technologies, and estimates for full-scale remediation will be compared to demonstration actual costs to determine reliability of cost models.

For more information, contact Gorden Huddleston at 406-494-7382 or hudg@mse-ta.com.

Environmental Cost Element Structure (ECES) Annual Update

Anand Gupta, DOE/EM Office of Project Management

Mr. Gupta gave a status overview of the ECES annual update. ECES is a standardized work and cost breakdown structure for all life-cycle phases of environmental projects. Because of changes in regulations, method of completing environmental projects, and advances in technologies, it was agreed that ECES should be updated annually. The proposed changes and comments include additional Long-Term Stewardship elements, addition of Safety and Health elements related to a project, addition of elements for Waste Management, and realigning some units of measures. Currently, the comments are out for review, and it is planned that the update will be completed by February 2002.

For more information, Anand Gupta can be reached at 301-903-8480 or anand.gupta@em.doe.gov.

Integrated Data Evaluation and Analysis Library (IDEAL) Estimating System

Bill Hombach, Team Analysis

Bill Hombach of Team Analysis gave a presentation on the IDEAL estimating system that can be used to develop cost estimates, to maintain cost models, and to share cost information. IDEAL, which uses XML, allows for sharing project cost

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models, cost estimating relationships, the cost estimates, and provides more flexible access to data. Additionally, IDEAL can have the capability to interface with other cost engineering tools such as Cost Risk, ECAS, and project management software such as Primavera. Cost models in IDEAL includes various environmental technologies and various phases (design, construction/installation, and operations and maintenance) of the project. In using the cost models, because the models are parametric, the users do not need detailed project information. For more information, Bill Hombach can be reached at 540-338-0601 or wghombach@teamanalysis.com.

Environmental Cost Analysis System (ECAS)

Jake Appetta, DOE NETL

Mr. Appetta provided an overview of the latest ECAS developments. ECAS is a web-based system developed to easily collect, analyze, and distribute EM cost data in the ECES format. Currently ECAS is only accepting DOE project data, but can be expanded to collect data from other agencies or organizations. The latest version of ECAS is complete and operational and some EM sites have entered project cost data. Also, latest ECAS can adjust for inflation dynamically, has the standard reporting capability for Excel or HTML, can capture data for long-term stewardship, and other capabilities. Draft version of the user manual is currently in development, and additional reporting capabilities are also being developed. For the future, more technology templates will be added, screens will be further simplified, enhance the user manual, and continually update incorporate comments from the users. ECAS is available for testing for the general public at http://ecas.netl.doe.gov.

For more information, contact Jake Appetta at 412-386-4762 or appetta@netl.doe.gov.

Headquarters' (HQ) Role in Improving Cost Estimating

Milton Gorden, ATL International
Bryan Skokan, DOE/EM Office of Site Closure

Mr. Gorden and Mr. Skokan initiated the discussion on the role of HQ in developing or assisting the Field Offices with estimating the cost of innovative technologies. There were discussions on the need to improve cost estimating tools, to provide contract incentives, and to obtain detailed level of cost information so that accurate comparison of innovative to baseline technology costs can be determined. The audience also expressed the need for standardization and to increase the use of cost estimating standards and tools. There was also exchange of dialog on possible new cost estimating initiatives such as increasing coordination between estimators and technology technical experts and creation of centralized points of contact information for innovative technology costs. EPA also stated that the Record of Decision (ROD) is not necessarily the final decision document on technology choices. The ROD can include provisions for more studies, and that EPA will sign RODs with new technologies.

For more information, contact Milton Gorden at 301-515-6781 or mgorden@atlintl.com.

Decision Quality Depends On More Than Just Analytical Data Quality

Deana M. Crumbling, U.S. Environmental Protection Agency Technology Innovation Office

There is a conflict apparent at DOE sites between keeping costs down and still providing good quality data of sufficient sampling density to assure satisfactory site characterization and to provide input for effective site management and decision making. The assumption that stringent analytical data quality requirements could substitute for sampling uncertainties has proved invalid. Improvements in field analytical technology has provided the means to address both sampling and analytical uncertainties. However, the author feels its time to change the data quality 'culture' and concentrate more on additional field sampling methods to minimize sampling related uncertainty, while reducing previously required 'fixed' laboratory analyses.

Electromagnetic Radiography™ for Subsurface Characterization of Contaminated Soils

Aka G. Finci, Detection Sciences, Inc.

Electromagnetic Radiography (EMR) has been used at a couple of DOE sites to provide images of mercury and other contaminants in the low ppm range. This high speed, relatively low cost process provides 100% coverage down to 50 feet. Disadvantages of the system is that is can't detect at the low concentrations (ppb) present at most sites, it's not effective when salt water is present, and it gives broad classification of contaminants only, such as dense non-aqueous phase liquids (DNAPL), but not individual contaminants. It may be an effective screening tool for some contaminants. The system is undergoing further development which should enhance its capabilities.

Hanford Site Vadose Zone Transport Field Studies

Mark D. Freshley, Pacific Northwest National Laboratory

Fluid injection experiments were performed at a Hanford field site to identify dominant vadose zone transport mechanisms. Two different field tests were performed, first involving injection of water and tracers to simulate dilute waste and the second involving injection of dense saline fluids to simulate high salt wastes. Nine monitoring technologies were used to log the injection rate and direction of transport.

Results indicated lateral flow dominated much of the Hanford vadose zone sediments, which has helped to correct early site models.

Watershed Characterization and Assessment Using NaI Detector and XRF Measurements

Michael Wade and Eric Brown, Duke Engineering

Ground surface radiation measurements and x-ray fluorescence (XRF) measurements of soil and sediment samples were performed at the Savannah River Site to determine potential risk associated with upgradient and/or upstream sources of potential contamination. Sampling sites in the watershed were determined from aerial radiological survey data. Each sampling site required extensive clearing through thick brush and swamps where wildlife was often encountered, including poisonous snakes and wild hogs. When the transect was cleared, it was screened with the NaI detector and samples were collected for target analytes. Also, in situ XRF field screening was performed. Screening of NaI data at a field lab permitted selection of appropriate detailed sampling sites. These preliminary field screening measurements compared favorably with standard laboratory measurements for cesium-137. The aerial radiological survey data, field radiation measurement methods, and XRF could serve as useful and rapid techniques for identifying soil and sediment contamination.

Expedited Site Characterization and Cone Penetrometer Technology: Application of Innovative Characterization

Gregory G. Rucker, Westinghouse Savannah River Company

The Expedited Site Characterization (ESC) method combined with Cone Penetrometer Technology (CPT) integrates geophysical and sampling techniques into an approach for characterizing ground water plumes. This is a phased approach; the first phase ("oops phase") focuses on the hydrologic framework; the second phase ("I got it now") is an extensive sampling and analysis phase utilizing mobile labs in the field. Following analysis and generation of graphics depicting the aerial extent and concentration gradients of the plume, additional wells can be added to fill in knowledge gaps. This phased approach has resulted in more cost-effective and efficient remedial decisions and corrective measures.

Radionuclide Contaminated Soil Remediation Technology Evaluation for Mound Potential Release Site 66

Gary S. Brown, Sandia National Laboratories

Innovative Technology Remediation Demonstration (ITRD) initiated the Ohio Heavy Metals project in 1995. The advisory group was composed of DOE, EPA, industry, and state and federal regulators. 17 innovative remediation technologies were evaluated, none selected and the project tabled until 1997. Renewed interest by DOE and stakeholders in June 2000 caused ITRD to form a Technical Assistance Advisory Group in July 2000. The Mound PRS 66 Technology Evaluation report was published in September 2001. The Mound site consists of 125,000 cy of soil contaminated by radionuclides, heavy metals, and VOCs. 238Pu and 232Th are the principal contaminants of concern, at 5500 pCi/g and 396 pCi/g, respectively. In situ immobilization was not a suitable option. The baseline option was bulk excavation and disposal of 26,000 cy of the highest activity soil. By minimizing the soil volume being shipped off-site for landfill disposal a great cost savings could be realized. To facilitate this, the endpoint criteria needed to be defined, the site needed better contaminant characterization and geostatistical probability mapping, a better excavation approach needed to be developed, needed to identify better field screen technologies to support removal, and needed to develop better physical or chemical processes that were applicable to 238Pu and 232Th removal. To accomplish this the endpoint criteria had to accept a large area spatially averaged (>100 m2) activity. Characterization was facilitated by substituting cone penetrometer for standard bore hole sampling, conducting additional surveys for buried objects using geophysical techniques and precision location systems, and production of 3-D probability maps of the two radionuclides. The excavation approach included using incremental lifts, scanning exposed dig face surfaces, performing scans using data logging and precision location systems, segregation of non-compliant soils, and use of compliant soils for site backfill operations. This precision excavation approach has the potential to save the site $10 million in excavation and disposal costs. Studies of soil washing using oxidants chelating agents and inorganic acids proved ineffective at reducing radionuclides to endpoint criteria.

3-D Spatial Probability Mapping of Contaminants at the Mound PRS-66 Site

Christopher A. Rautman, Sandia National Laboratories

Dr. Rautman presented the details of the 3-D probability maps, the soil-volume estimates, the isotope-inventory estimates, and the cost estimates for the previous talk on the Mound PRS-66 site. The "zinger" for this type of remediation problem is that unless the sampling or other measurements are spatially exhaustive, there is uncertainty in the spatial model of contaminant distribution, and this uncertainty is typically a strong driver of cost. Probability mapping makes use of spatial relationships among a set of data. The difference with classical geostatistics is that the emphasis is placed on the evaluation of uncertainty and its consequences, not on the accuracy of a specific local prediction. The process involves the determination of a histogram of the data values and a variogram of the data values to generate a large suite of conditional simulations. Dr. Rautman showed a number of 3-D maps showing the different volumes contaminated at differing activities of the radionuclides. His conclusions were that probability mapping in 3-D is a practical technique at contaminated sites even with modest data sets; that the probabilistic emphasis of the simulation-based approach is ideally suited to address the 'uncertainty' issues that are implicit in any environmental remediation project; that the approach is quantitative (likelihood of leaving contaminants in-situ, engineering estimates of volumes, grades, waste acceptance criteria (WAC), costs, and inventory considerations); and that the methodology is subject to external biases in data (the sampling and analysis program needs to be designed with the modeling/evaluation program in mind). At the PRS-66 site issues were found with the composting for excavation purposes, i.e. 5-ft samples for 5-ft lifts, with 'non-composted' samples (i.e. hottest portions), 'confusion' of replicate samples, lab-blanks with actual data, and databases being used as 'data-dump' repositories. As related in the previous talk, this approach was demonstrated to save the site more than $10 million in excavation costs.

Directed Air Sparge/Soil Vapor Extraction System at the Mound OU-1 Site

Gary S. Brown, Sandia National Laboratories

The problem at the Mound OU-1 site was volatile organic compounds in the vadose zone and ground water from historical disposal, removal, and reworking of organic waste. The baseline remediation technology was pump-and-treat. The ITRD project was initiated in 1995

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with a technical advisory group composed of DOE, EPA, industry, and state and federal regulators. A four acre capped landfill was selected as a demonstration site (Mound OU-1). Twenty potential remediation technologies were evaluated. Two technologies were selected for pilot scale demonstration, air sparging and soil vapor extraction. The highest concentration volatile organic compound (VOC) in monitoring wells was perchloroethylene (PCE) at 50.5 ppb, though trichloroethylene (TCE) and cis-DCE (dichloroethylene) were also present. The air sparging had mixed effects on ground water concentration with no significant reduction. The directed air sparge to facilitate removal of VOCs from stubborn tight formations was deemed ineffective. The air sparge system was shut down to prevent offsite migration of contaminants.

A Programmatic Approach to Deploying Bioremediation at the Department of Energy Portsmouth Site for Treatment of Trichloroethene in Ground Water

Michael Krstich, EMS/TechCon

Mr. Krstich presented how the integrated technical assistance approach involving the Innovative Treatment Remediation Demonstration (ITRD), TechCon, and a Accelerated Site Technology Demonstration (ASTD) project at INEEL were used to address a chlorinated solvent remediation problem at the Portsmouth Gaseous Diffusion Plant (PORTS). The two areas of concern were the X-749 Contaminated Materials Disposal Facility (CMDF) that was used for the disposal of material contaminated with hazardous constituents and low-level radioactive waste and the X-120 Goodyear Training Facility located near the X-749 Landfill that housed a paint shop, a welding shop, and a sheet metal shop that were used to train plant personnel at PORTS. The contaminant of concern was trichloroethene (TCE) since it was above 5 µg/L in the ground water. The targeted risk level for TCE was 1 x 10-6. The challenge for this site was the low permeability of the soils, which would prohibit effective delivery of in-situ remedies (oxidant, surfactant, etc.). Vertical hydraulic conductivity estimates were 2.6 x 10-5 ft/d and 1.3 x 10-4 ft/d. The entire 11.5-acre landfill was covered with a multimedia cap, and barrier walls extending down to bedrock were installed on its northern and northwestern boundaries to inhibit the flow of ground water beneath the unit. The technical assistance team recommended two remedial approaches: in situ bioremediation and phytoremediation. In Situ bioremediation was recommended for reducing the ground water TCE concentrations below the proposed remedial goal (PRG) within five years. Phytoremediation using hybrid poplars was recommended for areas not covered by the cap. Three phases were recommended, first designing and pilot testing a bioremediation process for a one acre site that would be effective, second planting of the hybrid poplars, and third the final deployment of the in situ bioremediation system on the 72 acre site. Hybrid poplars were planted nearby in 1999 and are already several feet tall.

The programmatic approach taken by the project team is unique from the standpoint that it enlisted technical expertise from a number of select DOE programs and it spent significant time and effort in activities leading up to the selection of a bioremediation company. The chronology of activities that supported this programmatic approach to deploying bioremediation at the PORTS site included: 1) a vendor forum in December 2000; 2) evaluation of vendor pre-qualification packages in January 2001; 3) development of technical specifications and scope of work in February; 4) issuance of a RFP in April; 5) collection and shipping of aquifer media samples to bidders in April; 6) development of proposal evaluation criteria in May; 7) evaluation of proposals and award of contract in August 2001; and 8) and deployment of bioremediation in FY 2002.

In September a patent infringement notification was filed and issuance of the contract was delayed. It is anticipated that the bioremediation technology will still be deployed in FY2002; however, both Phase I and Phase II are being rebid at this time. Dr. Krstich summarized his presentation saying that Technical Assistance takes many shapes, that it may require long-term involvement to achieve success, often multiple TA programs are required to support the project team, becoming 'intimately involved' with the project and project team is optimal, and finally carrying a TA through to closure is often the most effective mechanism for deploying technology and documenting its success.

In Situ Treatment of Explosives in Perched Ground Water at Pantex

James M. Phelan, Sandia National Laboratories

Pantex has perched water contaminated with TNT, RDX, HMX, and chromium from the high-explosive shops. This contamination presents a risk to the Ogallala aquifer. Interim corrective measures have relied upon pump and treat technologies, which have low yield extraction rates, but have been improved by reinjection upgradient and use of granular activated carbon (GAC) for treatment. The ITRD has considered a number of in situ treatment technologies that would facilitate cleanup of this site, e.g.. chemical oxidation, chemical reduction and biotreatment. These directed treatment strategies are considered technologically viable but require lab treatability studies to determine efficacy of mineralization. Potassium permanganate was found to yield a number of daughter products from 14C-RDX. Using aquifer material it was found that 14C-RDX was completely destroyed by KMnO4 in as little as 10 days with mineralization approaching 80%. Other experiments also suggested that KMnO4 could transform RDX at even lower concentration; however, the cumulative mineralization rate was only 20-40%. Biotransformation studies under anaerobic conditions suggested that 40-70% was mineralized to CO2 in less than 40 days. Abiotic reduction with ferrous iron using dithionite showed very rapid reduction (minutes), but the extent of mineralization is still being studied. Using Pantex sediments, more

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than 2/3 of the RDX was degraded by the dithionite-stimulated reduction in less than 0.4 hours. All three in situ treatment technologies show promise. The next steps are to develop treatment scenarios, conduct field-pilot tests to establish applicability under field conditions and develop engineering costs to support budget re-baseline.

New Directions for DOE's Innovative Treatment and Remediation Demonstration (ITRD) Program

Malcolm Siegel, Sandia National Laboratories

In FY2001, the ITRD program carried out projects at Hanford, Paducah, Oak Ridge, and Mound, Pantex and Los Alamos. Contaminants of concern included strontium-90 (Sr90), carbon tetrachloride, trichloroethylene, other volatile organic compounds (VOCs), the explosive RDX, technetium-99 (Tc99), plutonium-238 (Pu238) and thorium-232 (Th232) in surface waters, ground water and soils. The ITRD projects supported several deployments of innovative technologies. These included: use of zero valent iron in a reactive treatment wall at Paducah, recommendations and work plans for a C-sparge well at Paducah, a directed air-sparge test at Mound OU-1, revisions to excavation plans for radionuclide-contaminated soils at Mound PRS-66, and deployment of a storm filter water treatment unit to remediate surface water contaminated with barium and RDX and at Los Alamos Technical Area-16 (TA-16).

The goal of the ITRD program is to overcome the barriers to innovation in environmental management by reducing the risks associated with new remediation technologies. These barriers include technical issues such the plugging of reactive barriers or excursions from soil flushing well fields as well as the nontechnical issues associated with environmental regulations or cost estimation procedures. Through the ITRD process, alternative remediation technologies are ranked based on cleanup effectiveness as well as projected vendor cost. In some previous projects, the cost estimates provided by vendors did not reflect realistic expenses of deploying the technology on DOE sites. The reasons for the poor cost estimates included the vendor's lack of familiarity with the nature of the contaminant, site geology, or required waste management procedures at DOE sites, poorly defined cleanup endpoints, failure to consider risk to workers, and a desire to maximize corporate profits. In addition, there may be insufficient incentives for the DOE or DOE contractors to bear the risks associated with unproven technologies that claim to work "faster, better and cheaper".

Innovative technologies can be effectively barred from the DOE sites by high projected site and overhead costs. In recent projects, the difference between the initial cost estimate used to rank the technical alternatives and the final cost estimate differed by up to 800%. Concerns over worker safety have also become important barriers to innovative technologies. The costs of compliance with environmental safety regulations and the irreducible risks to workers must be considered in choosing between technologies. In some cases, the risks associated with aggressive clean up might be greater than the risks associated with passive remediation.

During FY2001 and FY2002, the ITRD program is developing new approaches to deal with these nontechnical barriers to innovation. These include adoption of accepted uniform cost estimation techniques in the ITRD process, consideration of worker risks, and consideration of contract incentives or disincentives to innovation. In addition, ITRD program will improve its evaluation of technical aspects of remediation through the use of innovative modeling tools to design effective remediation systems and thereby reduce cleanup volumes and costs.

The ITRD program is working with the DOE Applied Cost Engineering team to evaluate cost estimation tools such as the Integrated Data Evaluation and Analysis Library (IDEAL). This object-oriented system includes a library of historical cost data, the ability to generate cost-estimation relations for new technologies and accessibility over the web. A demonstration of IDEAL was carried out at Sandia Labs recently. The demonstration showed that the program is user-friendly and could generate planning level and detailed vendor cost estimates. However, it requires extensive additional information on site overhead and contractors costs to generate full deployment cost estimates.

Worker safety can be considered in the ITRD technology selection process through use of tools such as Technology Safety Data Sheets (TSDS), the Compliance Cost Matrix formulated by the Operating Engineers National Hazmat Program, and other guidance from groups such as OSHA and the National Institute of Environmental Health Sciences. The risk to workers from an aggressive cleanup should be compared to the risk to the public associated with passive remediation and less conservative (higher) cleanup goals. A key element in negotiating higher risk-based cleanup levels is stakeholder involvement early in the ITRD process. Higher risk-based cleanup goals might be determined using innovative user-friendly risk assessment tools.

The methods and focus of the ITRD program are beginning to change due to number of factors. These include increases in the costs of pilot studies on DOE sites, greater concerns over worker safety, contract reform and its associated effects on incentives or disincentives to innovation, and shrinking budgets. In order to adapt to this new environment, new tools are being developed or used by ITRD as part of its technology evaluation process. These include innovative approaches to cost estimation, modeling and risk assessment. Addition of these capabilities to the traditional ITRD "tool box" of treatability studies, facilitation and cost/performance reports, will lead to a more effective approach to reducing the risks associated with introduction of innovative technologies at DOE sites.

Subsurface Contaminants Focus Area (SCFA) Meeting

The Subsurface Contaminants Focus Area (SCFA) has been instrumental in helping sites across the DOE complex address subsurface problems through research, technology development and in recent years, through technical assistance. As a partnership between SCFA and 13 DOE facilities, a virtual laboratory has been created within DOE to provide much needed guidance, expertise, and assistance in identifying appropriate solutions to site problems. For the past several years, the SCFA Technical Assistance Program has been one of the most highly acclaimed successes of the Focus Area. End users from several sites across the complex came to Albuquerque this year to share their experience with, appreciation of, and ideas about the technical assistance program.

Jim Wright, SCFA Manager, welcomed session participants, provided some history of the technical assistance program and explained that the need for technical assistance will continue to increase as sites apply the products of research and development to address technical subsurface problems. Jack Corey, Lead Lab Manager for the program, noted that in FY02, $1.3 million was allocated among the partner labs as a resource to respond to site technical assistance needs. Corey explained that the role of technical assistance teams is not to provide advice and expertise on potential solutions. He also explained that one of the reasons the program has been able to provide rapid responses to site needs is that there is no time-consuming exchange of funds for services between the sites and partner labs, thereby eliminating associated administrative and transaction costs. According to Corey, requests for technical assistance come in about once a week. Depending on the site's request, responses can vary between a phone call with an end user to a multiple day, on-site work session that convenes end users with experts from the partner labs. Corey concluded his remarks by noting that the nature of technical assistance requests may change as DOE begins to focus even more on closing sites such as Fernald and Rocky Flats.

For more information, contact Jack Corey, SRTC, 803-725-1134 or john.corey@srs.gov.

Kevin Cabble from the Nevada Operations office explained that while the Nevada office hasn't specifically requested technical assistance from SCFA, the site has benefited from SCFA funded projects including research into a low-cost closure cover for arid sites, application of the segmented gate system to reduce soil volumes, and research into down-hole tritium monitoring of ground water.

For more information, contact Kevin Cabble, NV Operations Office, 702-295-1113, cabble@nv.doe.gov.

Tess Byler, representing the Stanford Linear Accelerator Center (SLAC), described the benefits of SCFA's technical assistance effort to help the SLAC project team identify effective tools for evaluating and addressing three different ground water plumes at the facility. Following a review of data and a two-day workshop on site, the technical assistance team recommended that the site develops a 3-D, comprehensive conceptual hydrologic model that further characterizes site hydrology, maps contaminant fate and transport, and monitors ground water flow. The team also recommended that SLAC consider adding wells to the site and consider using a ribbon sampler or other characterization technology to validate the model. Through this effort, the technical assistance team was able to offer the SLAC project team fast, and objective technical advice that both validated the project team's approach and presented new ideas about a large scale technical model that will help SLAC meet its 2003 closure deadline.

For more information, contact Tess Byler, SLAC at 650-926-3458, tbyler@slac.stanford.edu.

Leslie Ferry from the Lawrence Livermore National Laboratory (LLNL) provided an overview of the lab's request for technical assistance to address a complex of landfills requiring characterization and an economical and cost-effective technology to stabilize and contain contaminants. As described by Ferry, the technical assistance team assigned to this effort contributed new ideas to the project team evaluation, validated technical concerns, and refocused the technical direction of the project. Byler also noted the added credibility given to the site's approach following the regulatory agency's review of the report prepared by the technical assistance team.

For more information, contact Leslie Ferry, Lawrence Livermore National Laboratory, 925-422-0060 or ferry2@llnl.gov.

Tom Williams described the outcome of the Ohio Cost Savings Group request for technical assistance to help the Ashtabula facility address five different issues, including polychlorinated biphenyls (PCBs) in soils, an National Pollution Discharge Elimination System (NPDES) permit, use of bioremediation, evaluation of a geoprobe, and application of a soil washing technology. Williams emphasized the important role played by the technical program officer, Doug Maynor, in coordinat-

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ing the technical assistance effort at Ashtabula. The technical assistance team's recommendations on the cleanup of PCB-contaminated soil and approach for addressing NPDES permit issues resulted in a cost savings of approximately $1.5 million and substantially reduced operations and maintenance costs, respectively. Based on the recommendations of various technical experts from the Lead Lab Team, Ashtabula identified a contractor to initiate a bioremediation project at the site, obtained expert input on the development of a geoprobe, and reevaluated options for cleaning and disposing of contaminated soil.

For more information, contact Tom Williams, Ashtabula, 440-993-1944 or tom.e.Williams@ohio.doe.gov.

Office of Project Management (EM-6) Meeting

Dave Pepson of the EM Office of Project Management (EM-6) lead this session with a detailed discussion of the background, purpose, and thrust of the many initiatives underway to enable the Office of Environmental Management (EM) to better manage its projects. He described the background of DOE Order 413.3, Program and Project Management for the Acquisition of Capital Assets. This DOE Order has its roots in a July of 1999 report that the National Research Council (NRC) published entitled Improving Project Management in the Department of Energy, which was based on interviews with key project managers in the DOE system. The NRC report, which was very critical of DOE's project management efforts, lead to the formation of the Office of Engineering and Construction Management (OECM) as well as the formation of Project Management Support Offices (like EM-6) throughout DOE. Findings from the NRC report and the initiatives that EM-6 is currently undertaking to address them, were discussed. Information on project management policies, guidance, and procedures, as well as key project management tools can be found on the Office of Engineering and Construction Management (OECM) website at: http://www.cfo.doe.gov/oecm/index.htm. If you would like a copy of the NRC report, contact Dave Pepson at david.pepson@em.doe.gov or 301-903-7604.

Leonard Mucciaro (EM-6) described the Earned Value Management System (EVMS) as a tool that is available to project managers that allows both government and contractor program/project managers to have early visibility into technical, cost, and schedule progress and performance of their projects. The EVMS process: helps provide a clear definition of work prior to beginning that work; helps in developing plans that are rooted in reality; assists a manager to request needed help; assists in identifying areas that require additional management attention; encourages realistic projections of final costs; enhances accuracy of funding forecasts; reduces the propensity to add work without adding budget; and fosters management decisions within a framework of reality rather than latent unease.

National Deactivation and Decommissioning Committee Meeting

The National Deactivation and Decommissioning Committee discussed both national deactivation and decommissioning policy issues and site-specific activities. The topics that were discussed are summarized below. Please see the Excess Facility Transition to Deactivation and Decommissioning website at http://www.em.doe.gov/deact/nddc.html for a more detailed summary of this meeting.

News from HQ

Improved knowledge of DOE activities at HQ ensures that D&D activities are coordinated and have a common vision.

D&D Focus Area Accomplishments

Understanding the Focus Area activities ensures that the technology users and the Focus Area can coordinate objectives and related activities.

Technical Support Update

Technical support available from the National Facility Deactivation Initiative (NFDI) was discussed.

Facility Disposition Long Range Planning

Consensus on the benefits of the Rough Order of Manitude (ROM) cost estimating model for long-term planning helps identify the appropriate path forward for maintenance of the tool.

Impacts of Order 413.3 on D&D

This discussion improved the field's understanding of the DOE project management order, and increased HQ awareness of the field's concerns about applying the order to facility disposition projects.

Land Trek Demonstration

The Committee was introduced to a tool that is potentially useful for planning excess facility transfers.

Equipment Loan Initiative

A tool that facilitates sharing and loaning of used and underutilized equipment among DOE sites was discussed.

Hanford Projects

Committee members are now better able to apply lessons learned at Hanford to projects at other sites.

Facility Disposition Project Reports

Committee members discussed accomplishments, lessons learned, and current challenges facing D&D projects around the complex.

General Atomics

The lessons learned from the decommissioning of this hot cell facility are applicable to many sites.

Infrastructure Initiative at Y-12

A better understanding of this unique modernization initiative facilitates the incorporation and accomplishment of similar goals at other sites.

Panel Discussion

Committee members discussed the status and implication of the metals recycling moratorium and other issues not on the agenda.

The Spring 2002 National Deactivation and Decommissioning Committee meeting will be held April 23rd and 24th at the Rocky Flats Environmental Technology Site. The Fall 2002 Committee meeting will be held on November 14th in conjunction with the TIE Workshop in Oakland, CA.

Ad Hoc DOE Geographic Information Systems (GIS) Users Group Meeting

The ad hoc DOE GIS Users Group was formed in 2000 and met for the first time at the ESRI International User Conference in July 2000. The Users Group was created to promote the informal interchange of information and ideas between GIS users across the DOE complex pertaining primarily to environmental management and long term stewardship issues. The group was co-chaired in 2000-2001 by Denise Bleakly (Sandia National Laboratory (SNL)) and Jim Bollinger (Savannah River Technology Center/Savannah River Site). For the year 2002, the Users Group will be co-chaired by Denise Bleakly and Paul Rich (Los Alamos National Laboratory) and Jim Bollinger will serve as the secretary. The ad hoc Users Group meets twice per year-an informal meeting at the ESRI Users Conference in San Diego and a day long meeting associated with the DOE-sponsored Technical Information Exchange (TIE) Workshop.

Over 25 GIS professionals from across the DOE complex representing DOE-HQ and most of DOE's production and laboratory facilities engaged in a very informative and wide-ranging discussion. The minutes from the Users Group meeting at TIE are provided below.

Denise Bleakly of Sandia National Laboratory provided an agenda for the ad hoc DOE GIS User Group Meeting and made opening comments. Susan Hargrove, a representative from the DOE Headquarters office of the Chief Information Officer (CIO) updated the user group on the status of the CIO's involvement in GIS. The CIO's office in conjunction with the DOE Emergency Communications Network (ECN) is sponsoring a bimonthly video conference to discuss GIS issues impacting DOE. The CIO is interested in improving access to the most current geospatial data for daily operations, emergency response, planning, and infrastructure maintenance. The next video conference will be held the last Thursday of January from 2 to 4 PM EST. The CIO's office also has extended an invitation to all DOE GIS professionals to attend the Annual Information Technology Conference from March 16-18 in Denver, CO. Additional information regarding this meeting and the video conferences can be obtained from Susan at susan.hargrove@hq.doe.gov or at (202) 586-4108.

Susan reported that David Moorehouse of DOE-HQ continues to attend the Federal Geographic Data Committee (FGDC) Coordination Working Group Meetings on a monthly basis and that the FGDC is taking a new look at the use of spatial data since the 9/11 attacks. Specifically, the FGDC has requested papers regarding homeland security and has placed a guidance document entitled "Homeland Security and Geographic Information Systems" on the FGDC website.

DOE also has joined the Open GIS Consortium (see http://www.opengis.org), a non-profit organization whose mission is to deliver spatial processing interface specifications that are openly available for global use.

Randy Lee (INEEL) mentioned that while DOE HQ interest in GIS activities around the complex is very positive, there is essentially no interaction between the GIS group at the INEEL and the local DOE GIS representatives. This issue exists at several other DOE sites as reported by GIS users. In fact, Randy stated that he does not know the name of the GIS counterpart at the DOE Idaho Operations Office. Since most contractor funding issues are made at the local DOE operations office, it is critical that we establish contacts with the GIS representatives in these offices and let them know the capabilities and services that exist in the GIS organizations at each DOE site. Randy requested recommendations for making these contacts and forming a liaison with local DOE GIS representatives.

Susan referenced an Office of Management and Budget News Release citing GIS as one of 23 initiatives that will help improve customer service and efficiency. Although DOE-HQ is interested in harnessing the power of GIS technology, GIS currently does not have much visibility at HQ. Howard Landon, the former CIO, suggested to Susan that the user group develop a joint proposal regarding the effective use of GIS at DOE and present the proposal to the CIO council, which meets once per month. This proposal would need to address GIS interoperability between all DOE sites and HQ.

The user group addressed the possibility of establishing a bulk purchase agreement (BPA) with ESRI. The BPA would represent an agreement between ESRI and DOE that would provide additional software-related price breaks beyond what we get with the federal pricing structure. Paul Rich (LANL) cautioned that we need to insure that the BPA doesn't lock DOE into something that is less desirable than the federal pricing structure we already have.

The group discussed site license proposals from Al Guber (RSL-not present at the meeting) for GDT (roads/basemap data), Claritas (Business Point Data), and Pennwell-Mapsearch (Infrastructure data - electric lines, pipelines, etc) that would make this data available to all DOE sites at a greatly reduced cost. These proposals will be reviewed to make sure that they are beneficial to the overall GIS community. Denise Bleakly brought up the point that if a DOE site license if obtained, accessing this data over the internet would be an issue at SNL due to the firewall. In addition, Denise asked if the data would be available in different formats (Arc coverages, shape files, SDE layers, etc.).

Dan Collette of Grand Junction and Steve Rush of Hanford emphasized the importance of good GIS

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data management and configuration control policies. Dan and Steve both have experienced frustration with data quality issues involving legacy and current spatial data. Many other attendees echoed these problems. Steve encouraged sites to review their corporate data configuration policies to make sure that these issues are adequately addressed. He is the geospatial coordinator at Hanford and has had to deal with spatial data configuration control issues spanning several Hanford contractors. Hanford has developed policies and standards for dealing with data configuration control issues and Steve said he would be willing to share this information with other interested parties. Dan added that the state of Utah has set up protocols for handling data among state agencies and that the program they have instituted is an excellent example of good data management handling practices.

Mary Daum of Brookhaven National Laboratory presented an overview of the Land Trek system. Land Trek is a collaborative project between DOE and the Department of Defense to facilitate federal facility site cleanup, closure, and transfer or reuse. Land Trek is a web-based GIS and data analysis system aimed primarily at community and public outreach. The system, which Mary demonstrated as part of her presentation, includes map displays of landuse and quarterly ground water contaminant plume data. In addition to spatial displays, ground water geochemical data is available in tabular form. Future plans for the Land Trek system include the incorporation of air monitoring, operable unit, surface water, and contaminated soils data. Unfortunately, public access to the Land Trek website was removed after the 9/11 attacks.

At this point, Denise Bleakly asked what impacts the 9/11 attacks have had on GIS programs and data access at other DOE sites. She relayed that all long-term spatial data access to the public has been disabled at SNL, although much of this data is still available on the local county website. Denise voiced concern that removing public access to the SNL data was likely to damage DOE's and the Lab's reputation with the public. At Rocky Flats, an agreement with Jefferson County to share spatial data may need to be reviewed and changed due to post-9/11 security issues. Hanford had to pull some spatial data from its external web site and Pantex had to remove some information from local reading rooms - although with understanding and support from the public due to heightened security awareness.

Following discussion of the impact of the 9/11 attacks, the ad hoc DOE GIS Users meeting was adjourned. The next meeting of the ad hoc User Group will be during the twenty-second ESRI International User Conference, July 8-12, in San Diego, CA.

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Closeout

Mary McCune, U.S. Department of Energy, Office of Integration and Disposition (EM 20) and Gene Gardner, WPI, facilitated the TIE Workshop closeout. McCune began by acknowledging that there were almost 500 attendees at this year's workshop. In addition, the D&D National Committee, GIS Users Group, and Subsurface Contaminants Focus Area held piggyback meetings at the workshop.

The closeout provided an opportunity to reflect on some of the sessions and think about any lessons learned/success stories that participants can bring back to their sites. McCune requested that participants contact her directly about specific lessons learned at the workshop. She recommended that the lesson be submitted via the EM Lessons Learned website and emphasized the need for participants to support the TIE workshop in order to ensure its continuance.

McCune concluded with the awards for best poster and presentation and a reminder to complete and return the TIE survey. Awards were given to: Richard Marty, S.M. Stoller Corp., for best poster - titled "Enhanced Composing of Soil Contaminated with RDX, HMX, and TNT; and Joanna Burger, Rutgers University, for best presentation - titled "Assessment Tools for Ecological Services and Future Land Use."

TOUR Summary

Almost 40 attendees at the 13th Technical Information Exchange Workshop joined Sandia National Laboratories tour guides for tours of The Chemical Waste Landfill (CWL) facility and the Corrective Action Management Unit (CAMU). CWL was set up with five information stations, so that those in attendance could get a good grounding in the key operations at the site. The sites included a safety station, a look at the on-site analytical laboratories, a true "overview" (from a scaffolding) of site operations, a tour of the equipment used to render corroded gas bottles safe for disposal, and a demonstration of recycling/shredding of debris. A van tour of the adjacent CAMU was given, which is where landfill debris will be stored, treated, and permanently contained. Following the tour, many of the participants exchanged notes and lunched together at Sandia's Coronado Club.

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